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Register, Journal,

AND

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"Happily for knowledge and freedom we live at a period when, by the power of the printing press, that great redeemer of the multitude from ignorance and mental slavery, wisdom has become comparatively cheap, and the result of the labours of some of the most enlightened minds is placed within the reach of the poor as well as the rich."—*Detrosier.*

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INDEX

TO THE

AUTOGRAPHICAL MEMORIALS

OF

EMINENT PHILOSOPHERS, ENGINEERS, AND MECHANICS.

SECOND SERIES.

Aikin, Arthur, Esq., F.L.S. Secretary to the Society of Arts.
Airy, George Biddel, Esq., M.A. F.G.S. Plumian Professor of Astronomy and Experimental Philosophy, Cambridge.
Allan, Thomas, (late), F.R.S. L. & E. Author of some valuable Papers on Mineralogy and Geology, in the Transactions of the Royal and other Societies; died 1832.
Applegath, Augustus, of Crayford, Esq. Inventor of several valuable Improvements in Printing Machinery.
Arago, M. Dominique Francois, Member of the Institute of France, in which he succeeded to the place of the scarcely less celebrated Lalande, and Secretary to the French Board of Longitude; pre-eminent among the living Philosophers of France, for the splendour and universality of his genius; there is scarcely a branch of Science which he has not illustrated, and enriched by his labours. Joint Editor with M. Gay Lussac, of the "Annales de Chimie et de Physique."

Bakewell, Robert, Esq. Author of the excellent "Introduction to Geology."
Banks, Sir Joseph, late President of the Royal Society.
Barry, Sir David, M.D. F.R.S.
Barton, Mr. John, Engineer, Inventor of the Metallic Piston.
Bidder, Mr. George, the once celebrated "Calculating Boy," now Assistant Civil Engineer to the East India Dock Company.
Biot, M. Baptiste Jean, Professor of Natural Philosophy in the University of France, Member of the Institute, &c. Author of the "Traité de Physique," one of the most lucid and profound Works on the Physical Sciences, which modern times have produced.
Blackwall, John, of Crumpsall Hall, Esq. F.L.S.
Blake, Robert, Esq., Assistant Master Shipwright, Royal Dock Yard, Portsmouth, Inventor of the round sterns, patent fid, and many other valuable Improvements in Naval Architecture.
Blore, Edward, Esq., Architect, F.A.S.
Bostock, John, M.D. F.R.S. Author of "Elementary System of Physiology," and other valuable Scientific Works.
Bouvard, the able coadjutor of Laplace, in his Astronomical Investigations. "The immense calculations of Bouvard, have detected every varying phasis of the law of universal attraction."—*Leslie*.

Brande, William T. Esq. F.R.S. Professor of Chemistry, Royal Institution, Superintendent of Machinery, Royal Mint.
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Burnett, Sir William, M.D. K.C.B. Medical Commissioner of the Navy.
Burnet, Gilbert, Esq., Professor of Botany, King's College.
Busby, Charles Augustin, Esq., Architect, Brighton, Author of "Designs for Villages and Country Houses," "Designs for Modern Embellishments," Inventor of an Improved Water Wheel, Improved Mode of Heating Houses, &c,

Challis, Rev. James, M.A. Author of the very masterly Report, read at the last Meeting of the British Association, on the Theory of Fluids, and of some previous Tracts on the same subject, distinguished for their mathematical ability.
Cheverton, Benjamin, Esq., Inventor of a very ingenious Carbonic Acid Gas Engine, Author of numerous valuable Communications to this and other scientific journals.
Clegram, William, Esq., Resident Engineer of the Gloucester and Berkeley Canal.
Cleland, James, Esq. Author of "Annals of Glasgow," and many other valuable contributions to Scotch Statistics.
Cline, Henry, the late eminent Surgeon, founder of the *Clinical* System of Medical Instruction.
Conybeare, Rev. William Daniel, M. A. F. R. S. F. G. S.
Costard, Rev. George, A. M. late Vicar of Twickenham, Author of the "History of Astronomy," and other esteemed Works on Astronomical Subjects.
Cousin, James Anthony, Joseph, Author of "Traité du Calcul, Differentiel et Integral," and other valuable Mathematical Works; died 1808.
Cumming, Rev. James, M. A. F. R. S. Professor of Chemistry, Cambridge.
Cunningham, Allan, F. L. S. Sculptor,—better known as one of the most popular novelists and general writers of the day.
Curtis, John, Esq., F. L. S. Author of "British Entomology."
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Downing, Mr. Samuel, Working Carpenter; the Author of some Letters in this Journal, on the Education of the People, remarkable for vigour of sentiment and elegance of diction.
Dufresnoy, M. the distinguished French Geologist.

Elliotson, John, M.D. F.R.S. Professor of Practical Medicine, University of London, Physician of St. Thomas's Hospital, and President of the Phrenological Society.
Ellis, Sir Henry, B.C.L. F. R. S. Sec. Soc. of Antiq. Principal Librarian to the British Museum.

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Ferussac, Baron, the able and public spirited Conductor of the *Bulletin des Sciences.*
Fitton, W. Henry, M. D. F. R. S. F. G. S.
Forbes, James David, F. R. S. L. & E. F. G. S. Professor of Natural Philosophy in the University of Edinburgh.
Fowler, Charles, Esq. Architect; erected Covent Garden and Hungerford Markets.

Franklin, Captain, Sir John, R. N. F. R. S. Commander of the two Expeditions sent in 1819 and 1825, to determine the limits of North America.

Galloway, Thomas, Esq. M. A. Professor of Mathematics, Royal Military College, Sandhurst.
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Granville, Augustus Bozzi, M. D. F. R. S. F. L. S. Physician Royal Metropolitan Infirmary.
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Gwilt, Joseph, Esq., Architect, Author of "Treatise on the Equilibrium of Arches."

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Hancock, Mr. Walter, Engineer, Stratford, of Steam Carriage celebrity.
Haviland, John, M. D. F. G. S. Regius Professor of Physic, Cambridge.
Hall, Samuel, of Nottingham, Esq. Inventor of the Gas Singeing Apparatus, an Improved Steam Engine, &c.
Heath, James, Esq., Senior Associate Engraver, Royal Academy.
Heaton, Brothers, Engine Makers, Birmingham, Inventors of a Steam Carriage, Safety Gun Lock, &c.
Henning, John, Sculptor and Medallist; executed the beautiful miniature copies of the Elgin Marbles; the frieze of the Athenæum Club House, &c.
Henslow, Rev. John Stevens, M. A. F. L. S. F. G. S. Professor of Botany in the University of Cambridge.
Herschell, Sir William, the late Illustrious Astronomer; discoverer of the planet, which he called, in honour of his Royal patron, George the Third, the *Georgium Sidus*, but now more commonly known by the name of *Uranus;* discovered also the sixth and seventh satellites of Jupiter.
Heurteloup, Baron, the celebrated Lithotritist; received in 1833, from the French Academy of Sciences, the first prize in surgery, (6000 francs,) for his discoveries in Lithotrity; created also Knight of the Legion of Honour.
Hope, Thomas Charles, M. D. F. R. S. L. & E. Professor of Chemistry, Edinburgh; the discoverer of Strontian.
Hawkins, John Isaac, Esq., C. E.

Inman, Rev. James, D. D. Professor of Mathematics, Royal Naval College, Portsmouth.

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Jones, Dr. Thomas P. Superintendent of the Patent Office, Washington, Editor of the Franklin Journal.
Joynes, R. S, D. D. President of the Chatham and Rochester Philosophical and Literary Institution.

Kater, Captain, Henry, F. R. S. Inventor of the Convertible Pendulum, and Author of numerous Papers in the Transactions of the Royal Society, describing Experiments made with it to determine the Figure of the Earth.
Keate, Robert, Esq. Surgeon to St. George's Hospital.
Kirby, Rev. William, A. M. F. R. S. F. L. S. F. G. S. Rector of Barham, one of the Authors of the "Introduction to Entomology."
Kirby, Rev. Henry, M. A. Fellow of Clare Hall, Cambridge.
Knowles, John, Esq., F. R. S.
König, Charles, Esq., Foreign Secretary to the Royal Society, and Keeper of Nat. Hist. British Museum.

Lacroix, M. of Paris, Member of the Institute and Legion of Honour, Dean of the Faculty of Sciences, in the University of France; Author of numerous Standard Elementary Works on Geometry, Arithmetic, Algebra, &c.
Laplace, the Newton of France; Author of the "Mechanique Celeste," and "Exposition du Systeme du Monde;" Peer of France, President of the Academy of Sciences, and somewhile Minister of the Interior. Died 5th May, 1827.
"We cannot affirm that it was granted to him to create a science entirely new, as

Archimedes and Galileo have done; to give to mathematical doctrines original principles, like Descartes, Newton, and Leibnitz, or like Newton, to extend to all the universe the terrestrial dynamics of Galileo; but Laplace was born to bring every thing to perfection, to investigate every thing, to extend all the limits, and to resolve what had been thought incapable of solution. He would have completed the science of the Heavens, if the science could be completed."—*Baron Fourier's Historical Eulogy.*

Lawrence, William, Esq., F. R. S. Surgeon to St. Bartholomew's, Bethlem, Bridewell, and London Fever Hospitals.

Lecount, Lieut. Peter, R. N. F. R. A. S. Author of some valuable Investigations into the Magnetic Properties of Iron Bodies.

Leyburn, Thomas, Esq., F. R. A. S. Professor of Mathematics, Royal Military College, Sandhurst, and for more than thirty years Editor of the Mathematical Repository.

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Macintosh, Sir James, the late eminent Orator, Metaphysician and Historian, Author of the History of Ethical Science, in the Enc. Britt. For the loan of the interesting Autographical Criticism on Sir J. F. W. Herschell's "Discourse on Natural Philosophy," given in the Engraving, we are indebted to our esteemed correspondent Sir George Cayley, Bart., M. P. for Scarborough.

Mc. Konochie, Captain Alexander, Professor of Geography, London University, and Secretary of the Royal Geographical Society.

Malthus, Rev. T. R. M. A. F. R. S. Professor of History and Political Economy, East India College, Heyleybury; Author of the celebrated "Essay on the principle of Population."

Meyrick, Sir Samuel Rush, D. C. L. F. S. A. Author of "Critical Inquiry into Ancient Arms and Armour."

Morgan, William, the late Eminent Calculator, and Writer on Finance; died 1832.

Murchison, Rod. Impey, Esq., F. R. S. F. G. S. F. L. S.

Oersted, Hans Christian, Professor of Natural Philosophy in the University of Copenhagen, and Secretary of the Royal Society of Copenhagen; Founder of the new Science of Electro-Magnetism.

Paganini, Nicolo, the celebrated Violinist.

Paris, John Ayrton, M. D. F. R. S. F. L. S. Author of "Life of Sir H. Davy." "Science in Sport made Philosophy in Earnest." "Treatise on Diet;" the Inventor of the ingenious toy called the *Thaumatrope.*

Parry, Captain Sir, W. E. F. R. S. the celebrated Polar Sea Navigator.

Peacock, Rev. George, M. A. F. R. S. F. G. S.

Piazzi, of Palermo, the discoverer of the Planet Ceres.

Pond, John, Esq., F. R. S. Astronomer Royal.

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Prout, William, M. D. F. R. S.

Quetelet, M. Director of the Observatory, at Brussels.

Rennie, George, Esq., C. E. F. R. S.

Richardson, John, M. D. F. R. S. F. L. S. the Companion of Captain Sir John Franklin, in his North American Expeditions, Author of the "Zoology of North America."

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Robinson, Rev. T. R. D.D. Professor of Astronomy at Armagh.
Robinson, P. F. Esq., Architect, F.A.S. F.G.S. Author of the "Vitruvius Britannicus," "Rural Architecture," "Designs for Ornamental Villas, &c.
Roget, Peter Mark, M.D. Sec. Royal Society, F.R.A.S. F.L.S. F.G.S. Author of the Useful Knowledge Society's Treatises on Electricity, Galvanism, Magnetism, and Electro Magnetism.
Ross, Captain, John, R. N. F.R.S. the first and last, and upon the whole most persevering and successful of the modern explorers of the Polar Regions; is supposed to have discovered, in his last Expedition, the exact position of the North Magnetic Pole; Author of Treatise on Steam Navigation.
Rumker, Charles, Esq., the late indefatigable Director of the Astronomical Observatory at Paramatta, New South Wales; was the first to observe in 1822, the celebrated Comet of Encke, also the Comet of 1824.
Rutter, J. O. N. Esq., Inventor of the New Mode of Generating Heat, from Water and Tar, Author of Practical Observations on Gas Lighting.

Sabine, Joseph, Esq. M.A. F.R.S. F.H.S.
Sabine, Captain Edward, Sec. R.S. one of the Resident Committee at the Admiralty, for advising on Scientific Subjects; Author of "Experiments to determine the Figure of the Earth," for which he was awarded the Lalande Astronomical Prize, by the French Academy of Sciences.
Scoresby, Rev. (late Captain,) William, F.R.S. L. & E. Corresponding Member of the French Institute.
Sedgwick, Rev. Adam, M.A. F.R.S. F.G.S. Woodwardian Professor of Geology, Cambridge.
Shee, Sir Martin Archer, President of the Royal Academy, F.R.S.
Sinclair, the Right Hon. Sir John, Bart. L.L.D. the founder and first President of the late Board of Agriculture, Author of the Statistical Account of Scotland, History of the Public Revenue, Code of Longevity, &c.
Smith, Sir James Edward, Founder and First President of the Linnean Society, Author of "the English Flora."
Smith, Mr. William, of Hackness, Engineer and Mineralogist, F.G.S. the Father of English Geologists.
South, Sir James, President of the Royal Astronomical Society, F.R.S.
Stephenson, George, Esq., C.E.; executed the Liverpool and Manchester Railway, and Sole Engineer of the Grand Junction Railway, between Manchester and Birmingham, now in course of execution.
Stephenson, Robert, Junr. Esq. C.E. Sole Engineer of the London and Birmingham Railway.
Stevenson, Robert, Esq., C.E. F.R.S.E. F.G.S.; erected the Bell Rock Light House, next to the Tour de Corduan, the finest in the World.
Stratford, Lieut. W. S. F.R.S. F.R.A.S. Superintendent of the Nautical Almanac.
Sturgeon, Mr. William, of Woolwich, a Practical Electrician, and Philosophical Lecturer, of well merited Eminence; originally a private bombardier of the Royal Artillery.
Syme, James, Esq., F.R.S.E. Professor of Clinical Surgery in the University of Edinburgh.
Symington, William, late, C.E.; constructed the first Steam Vessel in Great Britain.
Smirke, Sir Robert, Architect, R.A. F.R.S.
Somerville, Mrs Mary, one of the profoundest Mathematicians (albeit her sex,) of the present age; authoress of the best summary of the astronomical labours of Laplace, which has yet appeared in the English tongue; first known to the Scientific World for some curious observations on the Magnetizing Power of the violet ray.

Taylor, Thomas, Esq., the able Translator of the Works of Plato, Proclus, and Aristotle; Author also of "Elements of a new Method of Reasoning in Geometry," "Dissertation on Diverging Series," and of several curious Papers on the properties of Numbers in this Journal.
Taylor, John, Esq., F.R.S. F.G.S.

Mechanics' Magazine,

MUSEUM, REGISTER, JOURNAL, AND GAZETTE.

No. 504.] SATURDAY, APRIL 6, 1833. [Price 3*d.*

"To misapply our talents is the most diffused and therefore the greatest of crimes in its nature and consequences: but to keep them unemployed is still worse."—BOLINGBROKE's *Spirit of Patriotism.*

THE TRIUMPH STEAM CARRIAGE.

THE TRIUMPH STEAM CARRIAGE.

Sir,—I did not intend to send you the prefixed rough drawing of my little Triumph steam-carriage until I could faithfully inform you of its full powers, in regard to speed and weight propelled; but, from considerations of expense and ill health, delay succeeds to delay until I fear some claims of priority, which I pretend to, may be denied to me. It is the little carriage, (built in 1828, and first mentioned in your Journal of 29th May, 1830,) improved in construction but the same in principle, and which was the first that ever ascended a rise of one in six; the chief alteration is the application of two main levers (see Mech. Mag. Jan. 7, 1832, page 266,) to obviate the necessity of having very large wheels.

It is built on what I at present consider the best principles of my theory, namely, placing nearly the whole weight, when in motion and needful, on the propelling wheels, giving a varying leverage to the power to any required extent, and making the line of direction of the power, when acting on the propelling wheels, to be such that its action and reaction shall as near as possible be parallel with the line of progress, by causing the fore carriage to have a tendency by its weight to propel the hinder part.

The main axle, wheels, and springs of this carriage are so attached to the carriage frame that they can be shifted backward or forward to vary the centre of gravity of the whole at pleasure, and also keep the endless chain stretched.

A A is the tubular boiler; B tubular chimney and steam chest; C steam pipe, cased deep in flannel, &c.; D a pair of cylinders, pistons, &c. working an endless chain wheel on the crank shaft and two small fly wheels; E another endless chain wheel, either fast or loose on the main-axle; F a pin on each fly-wheel, working alternately two main levers that catch in two clutch wheels fixed on the main axle; G coke box and water cistern; H feed door in the chimney; I pilot pole.

As soon as the engines start, the pins F on the fly wheels begin, by means of the connecting rods, to pull at the main levers, which levers by a reaction (if they are in gear) have a tendency to lift the fore carriage off the ground. (I have seen *it thus lifted quite off.*) By this operation the weight of the fore carriage is partly thrown on the hind wheels, increasing their interlocking force with the ground, and at the same time tends to pull them round by its gravity. Note, I do not mean to say that power is thereby gained, as all power comes from the steam, but that the power is acting in its best direction, being a transfer of the power of the steam to the gravity of the fore-carriage, as the steam, with a varying leverage, cannot well act direct on the main axle. When the road is level and good, the main levers are in a few seconds put out of gear, and the unvarying endless chain E put in.

I would say a word or two to Mr. Alexander Gordon and the *ultra* locomotionists. Steam locomotion on common roads is no longer a question of possibility, but of economy. Messrs. Ogle and Summers could tell, if they would, how much cheaper (or dearer) they went to Liverpool by steam than if horses had taken them (including wear and tear, but rejecting accidents); and Sir C. Dance could state his profits on the Cheltenham road. Both these and other parties richly deserve public assistance. But no! Somebody will have a monument when dead, but no help whilst living. Yet the public is not to blame; for to whom of the many projectors must it extend its bounty?

There was once a carriage and four horses went twenty miles an hour, at Newmarket, for a wager, and won it, yet the mails still are conveyed at half that speed. These Ultras forget that steam pistons cannot go more than 2½ miles an hour, and at that rate they will, like a horse, do a great deal of work, but if they must propel any thing at 20 miles an hour, they must either have little to propel or there must be a great many of them; and the question is, can these many be kept cheaper than horses? This waits for proof. Locomotion is a darling theme of mine, but I have paid my visit to *Utopia*, and am come back.—I wish again and again some one would build an 8 or 10 horse-power steam drag, to work one of the stage waggons at about its present rate of going, and then see what power could be spared for increasing the speed.

SAXULA.

March 14, 1833.

RECENT AMERICAN PATENTS.

h Remarks and Exemplifications by Dr. Jones.

(From the Franklin Journal.)

(PROVED MODE OF HANGING COACH IES, AND FORMING THE BOX AND OF WHEELS. *David Watson.*—s are to be made of cast iron, of sual form on the exterior, but with ate at each end in the interior, so receive a copper ring, cast for the ose, which is to be five-eighths of an deep, and three-fourths thick. These are driven in against a shoulder on end of the cast iron box, and are ed by riveting; they form the ng for the axle, the bore of the cast between them being such as to allow ce of three-eighths of an inch be-ı it and the axle. A hole is to be l through the hub and the iron box middle of the axle, for the purpose ıpplying oil. A sponge is to be d in this hole to retain the oil and cate the axle, and it is closed by s of a screw, to prevent the entrance t and water.—In hanging carriage s, the first improvement described putting of steel rollers three inches and an inch and a quarter diameter, upper ends of the jacks, over which horough braces pass. Under the of the carriage, and extending from nd of it to the other, over and in lirection of the perch, an elastic or strip of wood passes, which is inches wide and an inch thick, and is connected on its under side to ı, by strong spiral springs, which ranged in a way which could not early explained without the draw-but which are intended to give the perfect elasticity to the whole struc-and are, it is averred, capable of so managed as to cause the pas-r to ride with equal ease, whether e be loaded lightly or heavily.

CHINE FOR MANUFACTURING PINS. *J. Howe.*—In the ordinary mode ınufacturing pins, the wire is first htened in considerable lengths; wires are then cut, a number at a into lengths of six or eight inches; ext operation consists in pointing wires at both ends, which is also ed a number at a time; as many of *vires as can be conveniently* laid *he index finger,* be held down in a row, and rolled over by the action of the thumb, are brought into contact with stones, or file-cut disks of steel, in rapid motion, and thus pointed, the same operation being performed on each end. The length of a pin is then cut off by an apparatus again operating on a considerable number, and the pointing and cutting are thus repeated until the whole wire has been used. The operation of heading is performed upon each pin singly; the twisted wire is slipped over the pin, and receives three or four blows in the heading apparatus, which fixes it firmly in its place. With the exception of this last, all the processes are performed upon many wires at one time. Several machines have been made for the purpose of manufacturing pins; in some of them the heading has been performed like that of cut nails, by heading dies forcing up a portion of the wire of the shank, so as to form the head out of the solid stuff; the pointing, the cutting off, &c. have also been performed in the same machine. In that the description of which is before us, 'the wire is straightened, cut into lengths, headed, pointed, and the pin delivered from it in a state ready for whitening.' Although upon each individual these operations are performed successively, they are going on simultaneously upon different pins. Such a machine is of necessity complex, and the full exhibition of its manner of operation would require a considerable number of drawings. All we can at present say upon the subject is, that we have seen pins which were manufactured by it, and which were good, although they were the early products of the first imperfect machine. We hope soon to hear of the apparatus being in full operation, as, from the ingenuity of its construction, and its promising appearance, we think it worthy of a fair trial. The principal questions respecting it which remain to be settled are, whether, as the pins are made individually, that rapid motion can be given to the machine, and the pins be transferred from one part of the apparatus to another, without interfering, so as to deliver them in sufficient numbers to warrant this mode of making them; and whether, from accidental defects in the wire, or from other causes, the parts of the pin will not sometimes take a wrong course, and obstruct the action of the machine. This is not an unfrequent

accident in complex instruments which are to perform a considerable number of operations upon the same article. Whitney's card machine, however, may encourage us on such a question.

APPARATUS FOR PROTECTING SHIPS FROM LIGHTNING. *Elisha L. Keen.*—A truck made of glass is to be placed on the top of the upper mast; and upon each of the mast-head caps, covers of glass from half an inch to two inches in thickness are to be placed. These non-conductors being so placed, we are assured that the commanders of vessels may bid defiance to Jove himself, as they will be 'completely secured' against his attacks. We are likewise told, that whenever lightning strikes a mast, it always enters at top, disdaining to enter sideways, and that 'as the lightning rod of iron attracts and conducts when on perpendiculars, so will glass repulse and protect similarly situated.' Notwithstanding the logic of this conclusion, we are still unconvinced. We should place just as much confidence in a glass nightcap, or a bonnet of the same material, to protect the person against the attacks of the thunderer, as we should in these caps to ward off his blows upon the head of a mast. The fact is, that the whole thing manifests an entire absence of information respecting the nature of the power or agent, a defence against which it is proposed to furnish. The best and the only known security in such a case is a good and continuous metallic conductor.

FORMATION OF ARTIFICIAL MAGNETS.

Mr. Editor,—I shall feel much obliged by your allowing me, through the medium of your Magazine, to suggest the following experiment in magnetism to such of your readers as may feel an interest in the subject, and may be more fortunate than I in having the time and means to put the experiment into practice. The strongest artificial magnets—the strongest for their size ever made—were those which Mr. Knight formed by compounding a hard cemented substance of linseed oil and iron dust, and impregnating the compound, when perfectly dry and hard, with the magnetic virtue. The following plan would, I should hope, produce superior magnets:—Take steel *dust (to be had, perhaps, in the grinding-room of a needle-factory)*; prepare a hardening or drying fluid, such as linseed oil, or a resinous solution of such consistency that the steel will not settle to the bottom immediately when thrown in, but remain suspended for a short time. Next construct a deep box of glass, or some other non-magnetic material, whose bottom shall be of the intended dimensions of the magnet, and fill it with the fluid. A piece of card, one horse-shoe, and two bar-magnets of considerable power, will complete the apparatus. The box being filled with the fluid, place it between and in contact with the two poles of opposite name of the bar-magnets, and so that the magnets and the bottom shall lie in one right line. Now put a portion of the steel-dust on the card, place the card on the poles of the horse-shoe magnet, and agitate it slightly until all the particles shall have arranged themselves according to the control of the magnetic influence. Thus will every particle be converted into a separate and permanent magnet. Throw the dust so magnetised into the fluid, and as it sinks, the superior influence of the bar-magnets will prevent the particles from forming neutral groupes by their mutual attraction, and will cause them, on reaching the bottom, to arrange themselves in one line of unbroken continuance, from pole to pole of the bar-magnets. This operation is to be repeated until a sufficient quantity of steel is thrown in; the superfluous fluid is then to be drawn off with a syphon, and the artificial magnet left to harden or dry under the influence of the bar-magnets.

I am, Sir, your obedient servant,

φ. μ.

N. B.—I should recommend the employment of a resinous solution (or mixture liquefied by heat), as its electric qualities would not only favour the development of magnetic power, but perhaps also present some new and striking illustrations of the mutual relations of electricity and magnetism.

EXPEDITIOUS METHOD OF DISSOLVING AMBER AND COPAL.

Sir,—After numerous trials I have, at length, succeeded in making a saturated solution of amber and copal in spirits of wine and oil of turpentine, without the addition of any foreign substances. I have tried the methods described by Tingry, Varley, &c., but with common tur-

ne they will not succeed. Tingry's res no less a period than six months. plan I pursue is as follows:—Take a of glass tube about 4 inches long, h in diameter, $\frac{1}{16}$ inch thick; close ne end, and then introduce a few pieces of amber or copal; and fill ube about half full of alcohol, speci- avity ·790 (I have not tried a weaker); close now the upper end with the pipe, and hold it, by means of a twisted round it, over a clear fire. spirit will presently disappear, and ube be filled with a dense vapour; y then be removed from the fire, the vapours will be seen to condense once into a colourless fluid, which urn yellow as it cools. When copal erated upon it appears quite opake the tube is full of vapour, but re- s its transparency as it cools. When ubes are opened there is no escape of c fluid; and if the solutions are ed on a plate of warm glass, they flow into beautiful transparent var- s. The amber will, no doubt, form xcellent varnish for electrical pur- . When oil of turpentine is used, it ars to expand so as nearly to fill the ; when poured out it was nearly rless, and dried almost as fast as -varnish. I need scarcely add, that hand should be protected by a glove, the face with a plate of glass, or a l with a hole in the centre. To e varnish in the large way, a Papin's ster should be used, and the heat be regulated by laying the amber or l on the cover; when they melt, the may be judged high enough, as co- applied to the outside of the tube lly melted after it had been removed the fire some time.

I remain, Sir,
Your obedient servant,
G. Dakin.

eham, Feb. 27, 1833.

CARRIAGE-WHEELS.

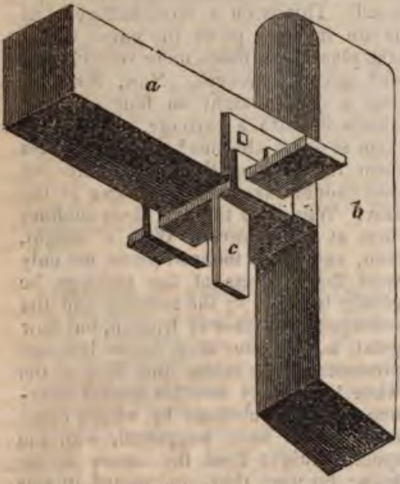
r,—Your readers are aware that the ls of all vehicles are made so that pokes incline from the centre to the , and thus that the tiring of the l on the ground is more under the ge than the centre. I would in- ; Why are wheels made after this ner? Is it for strength or appear- ? *I presume it must* be from some notion of increasing the strength; but I cannot conceive in my own mind, nor get it explained, how any strength can be ac- quired by this means. When a weight is on the wheels, the stress on the spokes must be very great, as from their inclined position they, by the weight at the hoop of the wheel, must act as levers in the mortices of the centre, as also in the mor- tices of the hoop, causing that split and shattered condition which both these parts of an old wheel present. At a loss for a good reason (which may be there is) for the present construction of carriage- wheels, I have wondered often, more and more as time has elapsed, how it is that wheels are not made upon the simple plan of the spokes being straight from the centre; in which case both it and the hoop would take an equal and regu- lar bearing. This much I say on the plea of the unnecessary leverage; but there is still another thing I do not un- derstand. Suppose you take a cart or carriage wheel and roll it on the ground, instead of its running in a straight line it will take a curve immediately with some speed. This is on a level surface; but on an inclined plane the curve would take place with much more velocity and with greater strength. Now, Sir, sup- pose a great weight on four of these wheels beneath a carriage, what holds them in a straight line? What restrains them from taking the curved direction they would take were they free of the axis? Why, it is the axis alone confines them at the centres. With a weight, then, and on an inclined plane, not only must the progress of the carriage be greatly impeded by the restraint and the consequent increase of friction, but how great, how ruinous must be the leverage pressure on the centre and hoop of the wheel! I fancy that this second objec- tion would be obviated by wheels being made as I have suggested, with the spokes straight from the centre to the hoop; for were they constructed in this manner they would if (singly) properly propelled go in a straight direction. As far as beauty of appearance is concerned, I am not aware that the present mode has it in any particular degree; in fact, I consider that from the pressure upon the wheels being diminished, and conse- quently less substance of material being required, a wheel constructed in the way I have proposed might be made lighter

and more graceful than any of the wheels of the present fashion.

I remain, Sir,
Your obedient servant,
J. E.

SLIDING-CATCH FOR THE SWING-FRAME FOR CHEESES.

Sir,—While making the "Isometrical Perspective" projection of the "Swing Frame for Cheeses," which you have given in a recent Number, it did not appear to me, from your former diagrams, how Mr. Blurton's "two catches keep the frame upright, and prevent it from being turned more than half round." In consequence of this, in my representation I introduced a bolt to keep the inner frame with the cheeses in an upright position; and I beg now to send you an isometrical perspective view of a "sliding-catch," by which means the frame could not be turned the wrong way; but without some such means it might, and all the cheeses be thrown out of their shelves.



a is part of the top-rail of the outer frame.

b, part of upright of ditto.

c, projecting-plate from slide-catch, against which one end of the side of the swing-frame would strike, and cause the slide to move until the frame stand perpendicular; but farther it could not go. On turning the swing-frame, the other end of the side would strike the opposite side of *c*, and cause it to slide back until the frame was again in a perpendicular position.

Had your engraver made use of one of the triangles I have recommended, he would not, I think, in reducing the drawing, have deviated so much from it. I trust, however, he will soon have more practice, and thus learn to be more correct, and also to avoid unnecessary shadowing and shading.

I am, Sir,
Your obedient servant,
JOSEPH JOPLING.

33, Sloane-street, March 30, 1833.

EFFECTS OF BURYING IRON AND STEEL IN THE EARTH.

Sir,—Some of the principal physical agents in the furtherance of human happiness being metals, and, amongst those metals, iron taking the foremost place, I was much gratified by reading your extract from the *Chronicles of Old London Bridge*, which seems to open some new views as to the further improvement of our national manufacture. But there is some obscurity in the statement of the circumstances, which it would be well to have cleared up, if possible, for the advantage of the experimentalists who may be inclined to trace the matter up to its causes, since "this effect effective must come by cause."

It seems that the burying of either steel or iron in the earth, for either "three years," or "six or seven hundred years," causes a decided improvement in its quality. Of what nature the improvement was, in the case of the razors which were buried, we are left in ignorance; but it seems that the change must have been wrought by an operation of natural chemistry, either taking something from the metal, or adding something to it, or both, by the process of chemical affinity. I should be led to imagine that both circumstances had taken place, as it is stated that though a coat of rust had gathered on the razors, they were not eroded, that is, had sustained no loss of substance. The process would then be perfectly analogous to what is called the petrifying of wood, or other organised substances, wherein, as the organised matter decays, a deposit of lime assumes the same form. To get at the complete facts, we ought to know—first, the chemical analysis of the razor-blades when first buried—secondly, the analysis of the "earth" in which they were buried—thirdly, the analysis of the

razor-blades when they were again dug up—and, fourthly, wherein the improvement consisted, or what new qualities were acquired by the steel. Mr. Weiss would render a great service to science and art by stating these particulars as far as his experience enables him, if, indeed, it were not interfering with his profits as a manufacturer, to make his secret known. This no man can be called upon to do, unless for specific remuneration. But I take it for granted, that the author of the *Chronicles* states the *facts*, and that they are not of a piece with the proposition of the gardeners, that "melon seeds should be worn some years in the breeches pocket previous to planting."

In the case of the pile-shoes of London Bridge, which were of iron, a change took place in the straps which were in contact with the charred timber, and not in the solid points. This is a different case from the steel which was buried in the "earth;" yet both the iron and the razor-blades were *improved*, though the circumstances were different. A supposition is given, that, in the case of the iron, the change was wrought by galvanism. Very possibly; but it would be for the interest of manufacturers and the public to know it more certainly. "Improvement," and "earth," are far from definite terms, and a variety of chemical distinctions may be comprised in them. The object sought for is, to effect by the chemistry of art, in a short space of time, that which takes the chemistry of nature "three years," or "some six or seven hundred years," to accomplish. Are there yet data enough to work by? If not, they should be sought; and, by careful inquiry and experiment, that would be made a matter of common knowledge, which is at present a matter of uncertainty.* I have understood that your correspondent, Mr. Rutter, is one of the favoured few possessing the rare combination of pecuniary means with public spirit. Surely the experiments I have endeavoured to indicate, offer a worthy field for the exercise of his talents.

Your obedient servant,

JUNIUS REDIVIVUS.

March 18, 1833.

*In almost all our metallic manufactures, mechanism is in advance of chemistry. The latter science has never yet been properly pursued as a whole, by an united body of men, but is indebted for its progress to the energy of individuals, who have from time to time devoted themselves to it, principally at their own *cost, and the public* at large have benefitted by their "labours of love."

CRACKS IN CEILINGS.

Sir,—It is a notorious fact that there are few, if any, lath and plastered ceilings without *cracks*, and it is equally well known to builders that in almost every account of a new building, and every account of subsequent repairing and cleansing, "stopping" *cracks* forms an item. However carefully stopped, the *cracks* soon re-appear,, and then the ceilings, if not renewed, must be papered or painted, or perhaps both to make them passable.

It is quite unnecessary to explain the general appearance of cracked ceilings, as that must be familiar to every reader of the Mechanics' Magazine.

This being the character of ordinary lath and plastered ceilings, it is obvious there is room for improvement, and it is hoped this paper will draw the attention of others to the subject.

The reason of cracks in ceilings is frequently attributed to the want of strength in or from the shrinking of the timbers. Although many cracks may be prevented by attention and judgment in construction, yet, owing to the want of elasticity in the ordinary plastering, it is, perhaps, with the greatest degree of care impossible entirely to avoid them.

Some ten or a dozen years ago, I had specimens of mastic on slate, tile, iron, and glass. By some means the glass of the latter specimen got broken, but the mastic still adheres to both parts and keeps them together—having no appearance of being cracked, which, perhaps proves that the mastic is more elastic than the glass.

A case having occurred where an ordinary plastered ceiling could not stand, I recommended that it should be rough boarded, and then covered with sheet iron and plastered with mastic: this having succeeded, another similar place was done in the same way; and I have no hesitation in saying they are the most perfect specimens of ceilings that I ever saw, although they are subject to considerable and frequent vibration—the floors being very elastic.

The exact cost was not ascertained, but it is considered for best rooms the expense will not be an object; and probably, if the frequent stopping of cracks, and subsequent repairs of the best ordinary plastered ceilings, and attendant cleansings, be taken into consideration, it will be found by far the cheapest—to say nothin

of its very superior appearance, and its also being, on account of the iron, a fire-proof ceiling.

There are many other situations in dwelling houses where iron and mastic may be introduced, and be the means of greatly reducing the risk from fire.

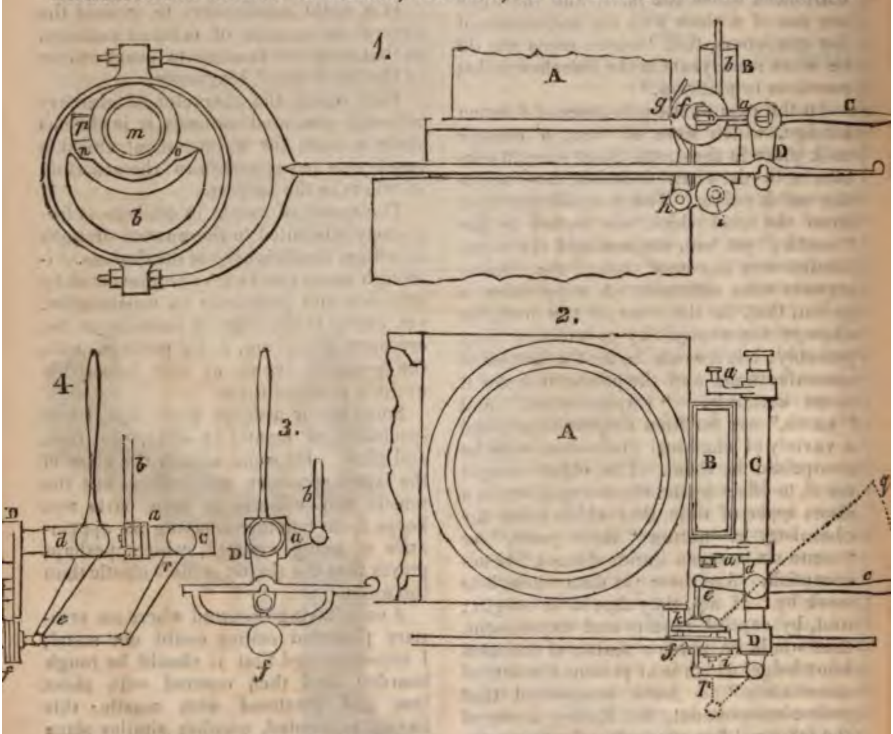
I am not aware that any explanation has ever been given why Hartley's method of rendering buildings fire-proof has not been adopted. Perhaps the difficulty of covering the iron so as to make a good ceiling may have been partly the cause. Mastic was not then in use.

With the hope of shortly directing the attention of your readers to materials for the ornaments of ceilings.

I am, Sir, your obedient servant,
JOSEPH JOPLING.

33, Sloane Street.

APPARATUS FOR SETTING IN MOTION, STOPPING, OR REVERSING THE STEAM-ENGINE.



Sir,—To be able to set on, stop, or reverse the motion in coal-pit, steam-boat, and locomotive engines, without shifting the hands from one lever to another, enables the person in attendance to effect his purposes in *less time* and with more *certainty*.

Fig. 1 is an elevation, and fig. 2 a ground plan, of a very simple apparatus for effecting the above ends, applied to a common low-pressure steam-engine. The same parts are marked by the same letters in both the plan and elevation. A, *is the cylinder; B, the nozzles; C, the wiper-shaft; D, the wiper; a a,* levers for working side-rods *b*, running alongside the nozzles to the cross-head on top of valve-rod. The starting-bar *c* works on a centre *d* in the wiper-shaft, and is produced beyond it till it meets the rod *e*, on which the pully *f* is at liberty to revolve or work lengthwise, to allow the bell-crank lever, *g h i*, always to rest in its groove. The lever, *g h i*, turns on a pin or stud *k*, fixed in the side of the cistern; the end *g* of this lever is a circle drawn from the centre of the wiper-shaft, so that the lever will not move when the valve is wrought by hand; the pully *i* turns on the other end, and lifts

or lowers into gear the eccentric rod, by a simple motion of the starting-bar sidewise. The eccentric *b* is at liberty to make half a revolution on the crank-shaft *m*, but is prevented from turning more by catches *n o*, fixed on the shaft, which work against the mug *p*, cast on the eccentric, so that in whichever way the engine turns, one or other of the catches on the crank-shaft will work the eccentric, so as to open and shut the valves at the proper time for the engine's working in that direction. When the starting-bar is in the position shown in the sketch, the engine-keeper can work the valve so as to start the engine in any direction, or stop it at any part of the stroke he pleases. After the engine is started in the direction wanted, the motion is continued in that direction by simply pushing the starting-bar into the position of the dotted line, *dq*, when the rod *e*, and lever *r*, will take the place of the other dotted lines, and allow the eccentric rod to fall into gear.

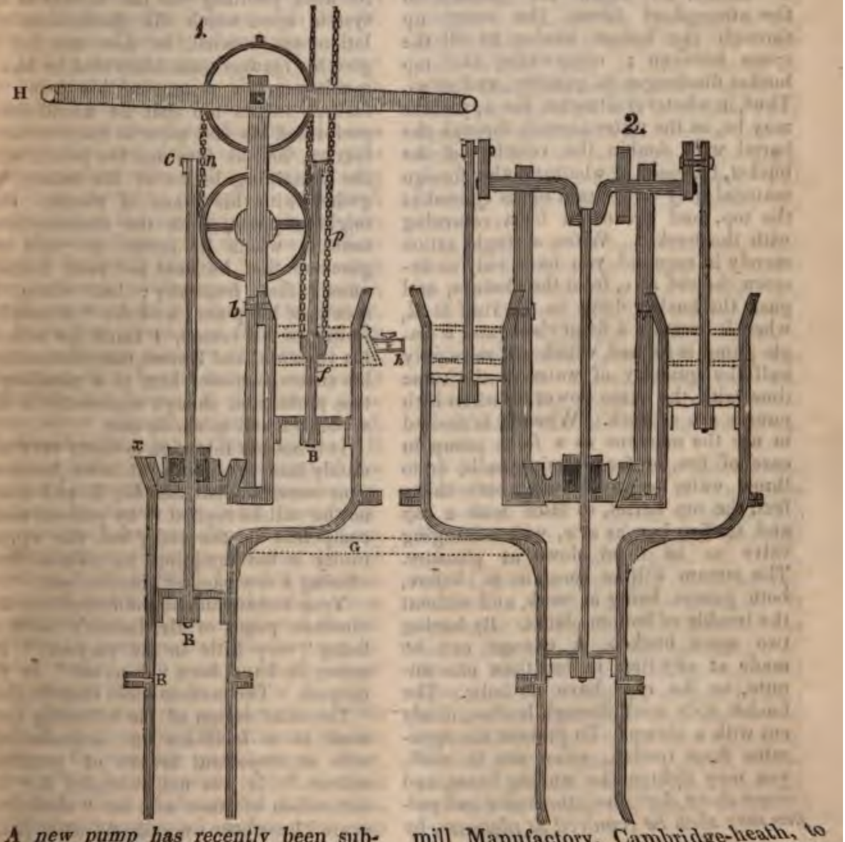
Fig. 3 is a side, and fig. 4 an end elevation, of this apparatus, where the starting-bar works in a vertical direction, and is so simple as to need no description. The same letters point out the same parts as in figs. 1 and 2.

JAMES WHITELAW.*

London, March 22, 1833.

* The author of the "Improvement in Barker's Mill," published in the Mechanics' Magazine of the 2d of March last, where an error of the *Franklin Journal*, in regard to the name of our correspondent, has been repeated. Mr. Whitelaw is now in this country, of which he is a native —ED. M. M.

WALKER'S SINGLE OR DOUBLE ACTING PUMP.



A new pump has recently been submitted by Mr. John Walker, of the Wind-mill Manufactory, Cambridge-heath, to the attention of the Lords of the Admi-

ralty, which offers the following advantages:—It will raise double the quantity of water which a common pump of the same diameter will do in the same time, and with the same power; it may be employed either as a single or double acting pump; it has no bottom clack; and is not liable to be choked, or to get out of order. A trial of it was made on board a barge in the Thames, in presence of a deputation of the Board, who were pleased to express a highly favourable opinion of its performances. Fig. 1 of the prefixed engravings is a representation of the pump, with which the trial was made. The dotted lines G represent the ship's deck. BB are the working buckets attached to an endless chain *n*, passing round pullies. These buckets are set in motion by means of the arm H. While the bottom bucket descends, the top one ascends, and forms a vacuum, on which the pressure of the atmosphere forces the water up through the bottom bucket to fill the space between; meanwhile, the top bucket discharges its quantity, and so on. Thus, in whatever situation the apparatus may be, as the water ascends through the barrel with double the velocity of the bucket, the sand, or whatever other foreign material may be brought up, is ejected at the top, and prevented from returning with the bucket. When a single action merely is required, you have only to unscrew the rod at *c*, from the chain *n*, and push the bucket down to the ring at R, when it becomes a fixed clack, and a single pump is formed, which will raise only half the quantity of water in the same time with the same power as when both pumps are at work. When it is desired to use the machine as a force pump in case of fire, or for watering sails, or to throw water to any height above thirty feet, the top barrel, so fitted with a cap and stuffing box as at *x*, with a hanging valve to be fixed down at pleasure. The stream will be constant as before, both pumps being at work, and without the trouble of bottom clacks. By having two spare buckets, a change can be made at any time in less than one minute, as the caps have no bolts. The bucket rods work through leather, nicely cut with a stamp. To prevent the apparatus from rusting, when not at work, you may tighten the stuffing boxes, and screw down the valve; the frame and pullies may then be removed at pleasure, by unscrewing the bolt *b*. Fig. 2 is for l lifts, or where a rotary motion is prefe It will be seen, from an inspection of engravings, that a bottom clack is dered quite unnecessary. If a bo clack were put in, it would be of no except when the pump was not at wor prevent its losing the water; and only if the working parts were very n worn, in which case all the fixed cl that can be put in would never raise water.

LIGHTING SMALL TOWNS WITH G

Sir,—It must be evident to all im tial readers, that your correspon "C" has made use of but a fl veil to conceal the real object he ha view, in publishing his remarks upon Rutter's little pamphlet on gas-light for after pointing out the defects o system upon which Mr. Rutter's ca lations are founded, he does not fa give his readers some hints that he h much superior system of his own. further strikes me that he would performed his task more to his own s faction, had he favoured the public the remaining letters of his name gether with his place of abode. might suppose, from the contempt tone in which he sneers at "gas gineers," that he does not rank hi among that fraternity; but when speaks of his plans, and the "scien setting of his retorts, I think he ac his vocation, and I must, notwithstan his sneers, consider him as a memb that profession, though apparently a appointed and splenetic one.

It is not my intention to enter ver nutely into the points at issue bet your correspondent, and Mr. R. as I c not he will be replied to by persons competent to the task; but the o tunity is too tempting to refrain offering a few passing observations.

Your correspondent condemns the nineteen pages of Mr. Rutter's wo being "very little to the purpose." seems to have been "deceived" in purpose. The preface states clearly, "The chief design of the following work is to facilitate an acquaint with an important branch of pra science." It was not intended fo instruction of men who for "thirt years" have been unceasingly active

uit of the science; but to give, in clear popular terms, a brief description of various operations, for the use of the itiated. The omission of "Mr. sor's" name, as being "the first who bited it to public notice in London," have been an oversight; and I dare that if the public consider that Mr. R. not done justice to Mr. Winsor's nory, he will have no objection to ce it in a future edition of his pam-t. But C. has another object in view hus calling attention to the slight ed to Mr. Winsor's share in the in-tion; it leads him to inform us that in 0 *he* (C.) was experimenting upon the luction of gas, and constructed an ap-tus for 20*l.* which stood the test of teen years experience. Now it was in 2, two years *afterwards*, that Mr. Mur-1 lighted at Soho; so that, after thirty rs silence, another competitor is ight forward to dispute with Mr. M. honour of priority of invention.

t is a strange perversion of language ay that, at page 14, Mr. R. gives an ion upon the merits or demerits of the ious systems of purification. He mo-ly declines doing so. Not so your espondent: for with all the authority has in the preceding paragraph med, as the inventor of the science, bids us believe "the dry lime purifica-is decidedly the best." I have upon station a purifier upon each principle, can use them together or separately. now that a bushel of lime in the dry e will not purify 4,000 feet of gas, that in a liquid state it will purify 000: and hence, if the refuse lime water were not difficult to get rid of, ould adhere to the latter system. It ues little for C's. knowledge of the ject to say that "the old system is re-ied by those only who, having in-red the heavy expense of the old pu-ers, are unwilling to abandon them as less." If needful, I could name a e of new works erected under various ctical men, who have adopted the old em in preference to the new, and in-d some old works which have ndoned the new to revert to the old.

gather, from the summary manner in ich C. disposes of Mr. R.'s recommen-ion to pass the gas through water, t your correspondent is one of those fashioned, good-natured folks, who, e the *manager of an important gas k in a neighbouring town*), "thanks his God he is no chemist." Mr. R., I can per-ceive from his writings, is a practical chemist, and has in this respect an im-mense advantage over his antagonist. C. says Mr. R. is "deceived"—"it is found that under any considerable pressure, water alters the chemical composition of the gas." Undoubtedly, else what advantage is there in the process, if some alteration is not effected? We are farther told that it "diminishes its illuminating power." Has C. proved this for himself? I think Mr. R. could tell him something more upon these subjects than he is at present aware of. What does the impure gas consist of? Ammonia, sulphuretted hy-drogen, olefiant carburetted hydrogen, and hydrogen gases. Had C. been a chemist he would have been aware of the effect water has upon the "chemical composition" of ammonia and sulphuretted hydrogen; he would also not have betrayed his ignorance of the little affinity which exists between water and olefiant gas, on the volume of which the illuminating power depends. But I am afraid all this is thrown away upon your correspondent. He has demon-strated to his own satisfaction "the supe-riority of his plan above all others," and it would ill become me to disturb his conscience.

It puzzles me to find what connexion there is between the scheme C. states he was consulted upon twelve years ago, and Mr. R.'s assertion, that it is only with-in a few years that gas lighting has made any considerable "*progress*" among the smaller towns. It certainly does not dis-prove it—rather, indeed, confirms it; for C. intimates that the scheme was aban-doned.

I do not know whether it follows, be-cause Mr. R.'s calculation of the profits of a work with a capital of 3000*l.* are founded upon the assumption that 160 private, and 55 public lights will be re-quired, that the apparatus should be con-structed to supply only that number. It appears to me that Mr. R.'s intention was not to give a delusive and speculative es-timate, but one that could be depended upon as the minimum of certain profits; and hence he calculates upon 160 private lights, where others would have taken 300. Were I a "gas engineer," I should always proceed upon this principle, and construct my work to supply the larger number, if ever required.

I have already extended these observa-

tions to a much greater length than I anticipated, and shall leave his analysis of the details for another letter, entreating C. to reserve any reply he may intend to make till he has all my remarks before him. I cannot, however, forbear here noticing that he takes rather a novel liberty with Mr. R.'s calculations: he makes such alterations in them as in his wisdom he deems prudent; twists them and distorts them into a shape which I am sure Mr. R. would disown, and then draws from them conclusions which he would fain make us believe are sanctioned by the original. Is this candid? Is it fair? By whose authority does he alter the charge for fuel from 25 to 30 per cent.? I can name a gas work where, when in full work, 100 bushels of coal are carbonised by 23; and if aided by the unsaleable tar, by 12 to 13; and I can further tell C. that he would be conferring a greater benefit on the science of gas making, than he is doing it mischief in promulgating such opinions as are contained in his letter, if he would turn his attention and devise some plan for making tar *alone* serve for *all* the fuel. Such an invention would indeed be an event; but I am afraid it requires more chemistry to perfect such a scheme than your correspondent considers necessary to

A Gas Maker.

March 22, 1833.

CONDENSATION OF AIR.

Dear Sir,—I have read with considerable interest Mr. Rutter's account of his experiments on air. Mr. Rutter supposes that part of the air is condensed into liquid, but I cannot admit that condensation takes place under the very moderate pressure of four or five atmospheres. I quite agree with Mr. Cheverton, that air *may* be liquified, but I suspect it will require a far greater pressure than has hitherto been attempted. Mr. Cheverton supposes that vessels are distended by the elastic force of the air, and that they require some time to resume their former state. I have several objections to Mr. Cheverton's hypothesis, one of which is, the very small elasticity of copper. I will now attempt to account for the phenomenon in question on a different principle. It is well known that air has a very great capacity for heat, and cannot, by any means *that we* are acquainted with, be entirely deprived of it; otherwise, it would become solid. If, however, we compress air, it will part with a considerable portion of its latent heat, and the more we compress it the more it will part with; but as the work of compression goes on very slowly, the heat escapes through the vessel, and is taken up by the atmosphere. If we now suppose the stop-cock to be turned, and the air permitted to escape, a great degree of cold will be produced within the vessel; but the copper vessel being a good conductor of heat, the remaining air within the vessel will soon acquire a part of the heat it had lost, and consequently its elasticity will be restored; and this may happen two or three times in succession, until the temperature, within and without the vessel, are equal.

I remain, dear Sir,

Your obedient servant,

A. Mackinnon.

Sheffield, Feb. 18, 1833.

MR. BABBAGE'S PLAN FOR REFORMING THE COINAGE.

Sir,—In your last number there is an article on the 3d edition of the Economy of Machinery and Manufactures, in which some very just strictures on the new matter introduced by Mr. Babbage are given. In commenting, however, on the decimal coinage proposed by that gentleman, you take a view of the subject which appears to me quite fallacious. You admit that the abolition of the guinea did not make twenty-one shillings pass for either less or more than they did before; and that Mr. Babbage's 'prince,' of two shillings, 'would not alter the value of the shilling in the least; but,' you go on to remark, in allusion to the plan of making twenty-five pence equal in value to the 'prince,'—"but the moment it was settled, by the alterations Mr. B. proposes, that a shilling should pass for twelve pence and a halfpenny, from that moment every person who had a debt, rent-charge, or annuity to receive, which had been adjusted according to the old coinage, would be *defrauded to the extent of four pounds in every hundred pounds.*" This is the fallacy. Persons in the situation supposed would not lose by the alteration one single farthing.

Take the annuity at one hundred pounds. When the new currency is in

ıced, will not the annuitant receive hundred sovereigns, each of exactly same value as before? You agree Mr. Babbage's 'princes' will leave hilling just at the same value as he d it. Let him be paid, then, in ıes. He will receive ten princes for pound, each prince precisely equal o of the old shillings. Nay, let him ıid the whole sum in copper, what ? Under the new arrangement he receive, for every pound, two hundred fifty of the new pence, comprising tly the same sum as two hundred and of the old. The proposed scheme es no alteration in the value of the and silver coinage. A pound then be just neither more nor less than a ıd now. Annuitants may therefore in their beds without being disturbed e anticipated 4 per cent. robbery.

ıt suppose the annuity is expressed in e. Aye, there's the rub; for although overeign and the shilling (or rather shillings) are to remain the same, the e are to be reduced in value—twelve e halfpenny are to go to a shilling ad of twelve pence. Large sums, ever, are not generally expressed in e; and as to small ones, the differ- will not be so very great—even if it ld not be adjusted. There can be no ble reason, however, why it should be enacted that, in all agreements ous to the change, 'sixpence' shall onstrued 'sixpence farthing,' just as shillings' will be, in all points of , twenty-five pence: and as to sums r sixpence, as the difference must be than even a *new* farthing, that I sup- the payer must even put into his own et, while the receiver consoles himself ıe loss, by recollecting that it is a sa- e for the public good. How much annum will it amount to over the e kingdom? Not enough, I think, nder the measure odious on the score s 'confiscatory nature.'

though, however, this objection to Babbage's proposal falls to the ground, not help thinking him in error when serves, that the alteration, now that uinea is superseded by the sovereign d be easily carried into effect. He d suppress the half-crown, shilling, sixpence, and replace them by en- new coins. This would be no slight in itself. I *suppose, too,* he would *a new copper coinage. If not,* he must either present the holders of copper money with a halfpenny for every shilling, gratis, or virtually mulct them at that rate for all the pence in their possession. Thus he would have to alter the whole of the silver and copper coinage,—the sovereign and half-sovereign (would he spare the crown?) only remaining as they are. It would be a long time, too, before the public would get used to the new silver coins of the value of twopence halfpenny, fivepence and tenpence.

I remain, Sir,
Your obedient servant,
F. H.

London, April 2, 1833.

We insert the preceding letter from respect for its very acute and intelligent author; but we can by no means admit that he has convicted us of any "fallacy" in the view we took of the manner in which Mr. Babbage's plan for an altera- tion of the coinage would operate. We take our stand on the self-evident general principle, that no one coin of a country can be raised or lowered in nominal value by an edict of the government, without more or less affecting every other coin for which it is legally exchangeable at that value. F. H. asks whether, if the new currency were introduced, an annuitant "would not receive one hundred sove- reigns, each of exactly the same value as before?" We answer—No, they would *not* be "exactly the same value," because 100 sovereigns are at the pre- sent time equal to 24,000 penny loaves, and after the introduction of the new currency, they would purchase 25,000. But would not the advantage in that case be on the side of the receiver? Certainly it would; and here we frankly admit that we committed a mistake in saying that it was the *receiver* instead of the payer who would be the sufferer—a mistake which the reader will please to ascribe either to the hurry of periodical writing, or to the confusion of the writer's ideas, according as his charity may dictate. This at all events does not alter the general result. It is true, as F. H. observes, that large sums are not generally paid "in pence;" but he forgets that it is "the many littles that make the meikle." Penny loaves to the number of 25,000 would require to be sold by the baker who owed a debt of 100*l.* incurred in the old currency, in order to enable him to discharge it in sove- reigns. F. H., in fact, gives up the whole

question, when he admits that wherever there are coppers in the case (which is *every* case, directly or indirectly,) the effect of the change would be to "mulct" the parties in possession at the rate of a halfpenny for every shilling. That is all we contend for.—Ed. M. M.

ANCIENT STUCCO.

Some years ago, when passing through the town of Cashel, in Ireland, I visited the old ruin on the rock, and in that part of the building supposed to be a Pagan Temple, I observed that some of the plaster had been removed from the wall, and under was discovered what appeared to have been a painting, on enamel or stucco, of the finest kind, resembling the purest Indian chunam. As many of the old arts have been lost, this might afford an opportunity to some one of the many very intelligent chemists of the present day, to ascertain what the composition is, it having evidently stood the test of many ages, without the appearance of the slightest deterioration.

J. N.

BISCUIT-BAKING MACHINERY.

We observe with great pleasure in the Navy Estimates for the present year, a proposition for a grant for 2,000*l.* to T. T. Grant, Esq., store-keeper of the Royal Clarence Victualling Establishment, at Weevil, near Portsmouth, for the invention of the ingenious biscuit-baking machinery recently erected at that establishment. For the following very circumstantial description of this machinery, and statement of the saving effected by it, we are indebted to a recent number of the *United Service Journal*:—

"The first operation in this biscuit-baking operation consists, you may suppose, in mixing the flour and water together; but I should tell you that, antecedent to that, the establishment has ground the flour in mills, worked by the same machine which gives motion to those parts I am about to describe. Nor is this an immaterial point; for by it all possibility of mixing improper ingredients along with the flour is prevented, and precisely that proportion of the bran which is required in the composition of good biscuit is retained. I ought likewise to have mentioned before, that adjacent to the mills stand a *series of four* granaries, each capable of *holding fifteen hundred* quarters,—in all, six thousand quarters. The flour mill is furnished with ten pairs of stones, by which forty bushels of flour can be ground and dressed, ready for baking, in an hour. The baking establishment consists of nine ovens, each thirteen feet by eleven, and seventeen inches and a half in height. These are heated by furnaces attached to each, so constructed that a blast of hot air and fire sweeps through them, and gives to the interior the adequate dose of heat in an incredibly short time.

"The commencement of the baking consists in introducing into a trough thirteen gallons and a half of water, and then allowing to enter it a sack of what is technically called biscuit meal flour, weighing 280 pounds. When the whole has been poured in by a channel communicable with an upper room, a bell rings and the trough is closed. A singular apparatus, consisting of two sets of what are called knives, each ten in number, are made to revolve amongst the flour and water, by means of the machinery. This mixing lasts one minute and a half, during which time the double set of knives or stirrers make twenty-six evolutions. Each batch of the dough thus rudely mixed weighs 388 pounds, and forms eventually two suits and a half of bread, weighing 250 pounds, or in other words, 1,250 biscuits, each suit or batch being 100 pounds in weight. The next process is to cast the lumps of dough under what are called breaking rollers, huge cylinders of iron, weighing 14 cwt. each, and moved horizontally by the machinery along stout tables. The dough is thus formed into large rude masses, six feet long by three broad, and several inches thick. At this stage of the business, the kneading is still very imperfect, and some traces of dry flour may still be detected. These great masses of dough are now drawn out, and cut into a number of smaller portions, about a foot and a half long by a foot wide, and again thrust under the rollers. I forget how many times the dough is made to pass under these rollers, but sufficiently often to make the mixture so complete that the slightest trace of inequality is not to be discovered in any part of its substance. I should mention that two workmen stand, one at each side of each roller, and as the dough is flattened out they fold it up, or double one part upon another, so that the roller at its next passage squeezes these parts together, and forces the parts to mix. After this process has been gone through a sufficient length of time, the dough is cut into small portions, and being placed on large flat boards, is transported by the sole agency of the machinery, in the most comical manner, from the centre to the extremity of the

baking room. Here it is received by a workman, who soon places it under what is called the sheet roller, but it would be better named the blanket roller, for in size and thickness, and nearly in colour, it resembles a blanket. The kneading is thus rendered quite complete, and the dough is in a fit state for the oven, and it only requires to be cut into biscuits. This part of the proceeding is admirably contrived. It is effected by what is called a cutting plate, consisting of a net work of 52 sharp-edged hexagonal frames, each as large as a biscuit. This frame is moved slowly up and down by the machinery, and the workman, watching his opportunity, slides under it the above-described blanket of dough, which is about the size of the leaf of a dining table, and in the next minute down comes the cutting-frame, indents the sheet, but does not actually cut it through; for enough of the substance is left uncut to enable the workman at the mouth of the oven to jerk the whole mass of 52 biscuits unbroken into the oven. It may be asked, how it happens that the dough does not stick to the frame? But this is prevented by a most ingenious device. Besides the cutting portion of each of the two hexagons, there is a small flat open frame, moveable up and down, carrying above it a ball of iron several ounces in weight. When the great frame comes down upon the dough, and cuts out the 52 biscuits, each of these minor frames yields to the pressure, and all the little iron balls are seen to rise up; but as soon as the great frame rises, the weight of the balls, acting on the little frames over each biscuit, thrusts the whole blanket off, and allows the workman to pull it out. One quarter of an hour is sufficient to bake the biscuit, which is afterwards placed for three days in a drying room, heated to 85° or 90°, which completes the process.

"The whole nine ovens bake about a ton of bread an hour, or ten thousand biscuits. If, instead of nine, there were twelve ovens, it has been calculated that 70,000 cwt. of bread might be baked in a year. Now, it appears that the average quantity issued from Deptford, Portsmouth, and Plymouth, during the last five years, was 68,000 cwt.; consequently, if this branch of the Royal Clarence Victualling Establishment were increased by only three ovens (and no further machinery), all the biscuit required by the navy might be prepared by the admirable process on one spot. The relative cost of making the above quantity of bread by hand, or by the machinery actually erected and in operation, I have taken some pains to ascertain:—

Cost by Machinery..........	£1,560
Ditto by Hand.	5,260
Saving in the wages of labour.	£3,700

"From this saving there must, of course, be deducted a portion of the interest of the money laid out in the machinery. I say a portion of the interest, because the same steam engine which moves the baking apparatus turns ten pairs of mill stones, and pumps up water for the supply of his Majesty's ships, and it is only a small part of the power, which must be kept in action at any rate, that is directed to these baking purposes. When, however, the large engine is not required to grind flour, or to pump up water, a small ten horse engine is set in motion, if it be required, to bake bread.

"The foregoing calculation of what 12 ovens could perform is an estimate. The following statement is derived from actual experiment:—

"In 116 days, during 68 of which the work was continued for 7½ hours, and 48 for 5¾ hours only, in all 769 actual working hours, equal to 77 days, at ten hours each day, the following quantity of bread was baked in nine ovens, at the Royal Clarence establishment—12,307 cwt. of biscuit, which is equal to 1,378,400 pounds.

The wages of the men employed in baking this quantity of bread amounted to	£273	10	9½
If it had been made by hand, the wages of the men employed would have been....	933	5	10
Saving in the wages of labour.................	£659	7	0½

"In this, I may repeat, is not included any part of the interest of the sum laid out on the machine, or spent in keeping it in order. But in a very few years, at such an immense rate of saving, the cost of the engine and other machinery would be repaid.

"The machinery bread, though at first objected to by many persons, has become universally popular in the navy. It is better, decidedly, than any which has heretofore been supplied to his Majesty's ships, and it promises to keep better. Formerly the sailors very rarely, if ever, took up the whole of their allowance of bread; but since the machinery biscuit has been issued, it seldom occurs that a single pound is left behind. If the intention of stowing it in iron tanks be followed up, the fresh quality may be preserved for any length of time, and the 'remainder biscuit,' after a voyage, cease to be a proverb redolent of weavils, mouldiness, and dust."

Mr. Ballingall's System of Shipbuilding.—It is worthy of remark, that although the Fifeshire Kirkaldy smack (built on Mr. Ballingall's plan), was at sea during the awful night of the 19th of February, which proved fatal to such a number of vessels, yet from the manner in which that smack is constructed, her inner bottom being made as tight as the outer one, she did not make a single drop of water. —*Fifeshire Journal.*

Wooden and Ambulatory Houses.—The estimate which "Hywani" requests is a matter quite beyond our calling; he should apply to some carpenter or builder. We may mention, however, that in a recent Number of Mr. Loudon's "Encyclopædia of Cottage, Farm, and Villa Architecture," there is an account of a portable wooden cottage, erected at Wargrave, near Henley-on-Thames, for Captain J. G. Hall, which contains an entrance-hall, servants' sleeping-room, kitchen, store-room, sitting-room, (12 feet square), bed-room, and lumber-room; and cost only, exclusive of the stoves and thatch, £120. "Hywani" has been misinformed as to "houses built on wheels not being subject to the assessed taxes and parish rates." The contrary was decided very recently in the case of a fruiterer, who occupies a shop on wheels at the end of Tottenham-court-road. It would be very unjust were the case otherwise.

Flying.—"Aerostaticus" informs us, that he has constructed "a model of an aerial car," which has been seen "by one gentleman of very eminent scientific attainments, who declared he could see no possible reason why it should not succeed;" and that "he calculates on his being able to make 30 strokes in a minute with the wings on the atmosphere with a force equal to his own weight and the machine; and double that for a short time when necessary." The inventor wishes us to invite our correspondents to contribute accounts of all the different inventions for the same purpose which have been made since the days of Bishop Wilkins, with an examination of the reasons for their failure. It would seem from this that he is not aware of the extent to which the subject of aerostation has already occupied our pages at different periods. We would particularly recommend to his attention the papers of W. C. (the late Sir William Congreve) in Nos. 240 and 243. He may also consult with advantage the Note to No. 77 of Mr. Partington's edition of the Marquis of Worcester's "Century of Inventions."

The Centre.—Saul Pinnim will perceive upon reflection that, mathematically speaking, the centre of a thing can have no distinct existence. If he could only lay hold of such an identical atom, there would be an end to all difficulty about squaring the circle. It does not, however, follow, that his antagonists are right in contending that "the centre of a gudgeon-crank or pivot, making 500 revolutions in a minute, never moves at all;" that would be to deduce a practical absurdity from a theoretical axiom with which it has no connexion.

Isometrical Perspective.—"A Learner" suggests that "a small cheap treatise, explaining in detail the whole mode of drawing in Isometrical Perspective, illustrated by diagrams and examples, would be of essential service in bringing it into general use." We beg to recommend the suggestion to our friend Mr. Jopling's favourable attention: we know of no person who could do greater justice to such a task.

Immersion of Conical Bodies.—"An interesting experiment was put in practice in this dockyard (Devonport) a short time since to prove the fallacy of the naval doctrine, that a floating body, conically shaped, may be more easily immersed with the apex upwards than if it were reversed. A new buoy, accurately shaped, which your readers know is formed like two hollow cones united at their base, was carefully marked round the centre and loaded with iron until it sunk to the middle; it was then taken up and weighed against as much more iron as would exactly balance it; and on being put again into the water, it appeared that the whole of the iron weighed against it was required to immerse the other half of the buoy, which then floated with its top just under the water's edge; thus proving, that precisely the same weight was necessary to immerse the upper half of the buoy or cone, with its apex uppermost, as that required to sink the lower half or cone in the inverted position."—*Devonport Correspondent of the United Service Journal.*

National Plan of Protection against Fire.—Extract of a letter from J. Robison, Esq., Secretary to the Royal Society of Edinburgh, to J. C. Loudon, Esq.:—"I have had some correspondence with the last and the present Administrations about a plan for extending a uniform system of fire-engine establishments all over Britain, by forming a regular disciplined corps of firemen at Woolwich, and furnishing officers and instructors from it to provincial corps to be established by the municipal authorities on the spot. I have not succeeded as I could wish, but I have made some impression; and the first-fruits of it are now developing themselves in your metropolis, where the Insurance Companies have begun to act in concert in getting up a regular corps on the model of the Edinburgh one, and have bribed away the superintendant from this place, to put him at the head of it. The connexion with the Police will follow next; and when experience shall have shown the truth of what I have urged, some person about the Government offices will step forward with the whole of my plan, claiming it as his own, and will perhaps get the credit for it. But provided the plan be adopted, I care but little who gets the credit of it."—*Encyclopædia of Cottage, Farm, and Villa Architecture.*

INTERIM NOTICES.

The Supplement to the last Volume, containing Preface, Title, and Index, with a Portrait of Professor Babbage, engraved by permission from an original painting, will be published on the 1st of May.

"A Suffering Inventor" is unnecessarily impatient. We shall take notice of Mr. Godson's Bill next week; all in good time.

We had no intention of clapping an "extinguisher" on J. J.'s calculator by classing it under the head "Projects," of which there are of all sorts, good, bad, and indifferent. If he will again favour us with his address (that which we had has been mislaid), he may probably be convinced that the use of the objectionable term has not operated to his prejudice so extensively as he supposes.

It will be better that H. Y. S. T. should favour us with an account of the "undeniable regulator" he speaks of, in order that we may present the bane and antidote together.

Communications received from W. C. S.—T.—Saul Pinnim—G. M.—Mr. Robert Wailes—Messrs. Wetterstedt and Co.—Mr. Ride—Mr. Stanley.

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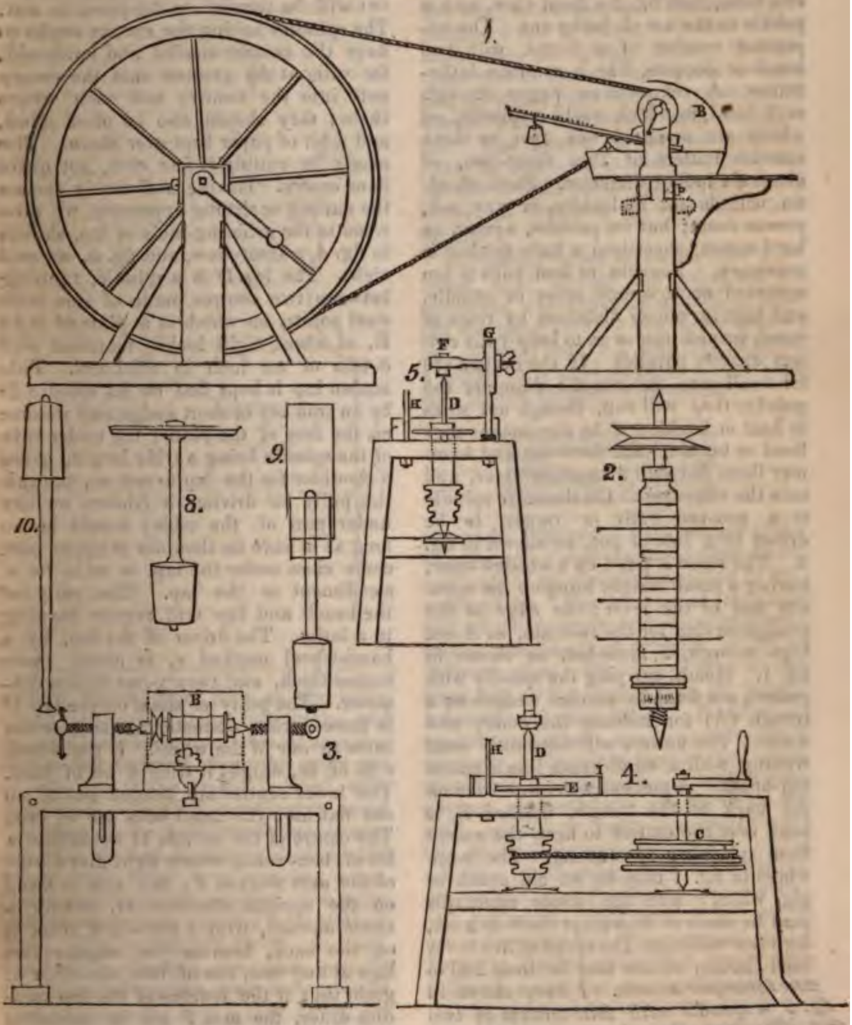
MUSEUM, REGISTER, JOURNAL, AND GAZETTE.

No. 505.] SATURDAY, APRIL 13, 1833. [Price 3*d*.

AMATEUR LAPIDARY'S APPARATUS.

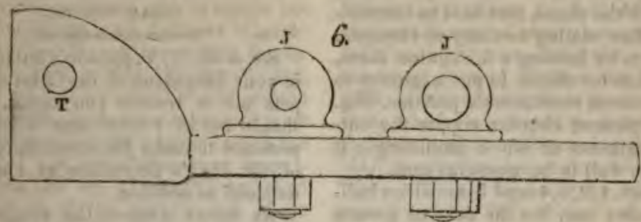


AMATEUR LAPIDARY'S APPARATUS.

Dear Sir,—In the Mech. Mag. for the 28th May last, there is an inquiry for a method of cutting and polishing stones, pebbles, &c. Having lately had considerable experience in this sort of work, I will first describe two machines of the simplest and cheapest construction, yet capable of cutting, grinding, and lapping, the best of work.

The machine first to be described is that for cutting or slitting. Fig. 1 is an end view, and fig. 3 a front view, with a pebble in the act of being cut. The apparatus consists of a frame, with two heads or poppets, like a common lathe-frame. A centre-screw passes through each head, in which works a spindle, on which are mounted one, two, or three circular cutters of thin sheet-iron, of about six inches diameter. Stout sheet-tin will do for malachite, or any soft, porous stone; but for pebbles, agates, or hard stones, sheet-iron a little thicker is necessary. Your tin or iron cutters are mounted on a square arbor or spindle, and kept at proper distances by rings of wood, turned true so as to keep your cutters exactly parallel. If the cutters are for small cuts, the less the diameter the quicker they will run, though not so as to heat or buckle; if by any means they bend or buckle, take them out and hammer them flat with a small hammer, and turn the edge true. On the same spindle is a grooved pully or rigger, to be driven by a line or gut, as shown in fig. 3. The stone is fixed on a wooden lever, having a small weight hung on the opposite end of the lever; the edge of the trough serving for the fulcrum, or if not high enough, a cross-bar, as shown in fig. 1. Heads, carrying the spindle with cutters, are fixed by wooden wedges on a trough (A) for holding the emery and water. The cutters will constantly want wetting with a small brush like a painting-brush. A piece of sheet-iron fixed on the back of the trough, marked B, is bent over the cutters to keep the emery from splashing or wasting. The large wheel in fig. 1 may be an old coach or gig wheel; and the whole apparatus may be made of fir, except the iron-work, for a few shillings. The speed of five or six inch circular cutters may be from 200 to 250 turns per minute. I have shown in *fig.* 2 a spindle with four cutters of two *feet diameter, though the* amateur will hardly require any that size, unless to cut marble, spar, or some such soft stone. The stones are fixed on the wood levers with a cement of rosin and brick-dust; when made like paste with heat, the stone is warmed and imbedded. The wood lever is two inches wide or more, and has notches on the under side like saw-teeth, that keep the lever on its centre like a scale-beam. Besides, if the stone require a second or third cut when once set to the thickness desirable, the cut will be parallel to the previous cut. The spindles having the cutters ought to have the centres steeled and hardened, for without the greatest care the emery gets into the centres and soon wears them; they should also be often oiled, and a bit of paper kept over them. The emery for cutting is fine corn, not quite flour emery. Having sufficiently shown the cutting or slitting apparatus, we now come to the grinding-table or lap, shown in fig. 4, a front-view, and fig. 5, an end view. The lap D is a spindle, running between two centres made of iron with steel points, on which is a plate of lead E, of about eight inches diameter and 3-4ths of an inch in thickness. This leaden lap is kept fast on its spindle D by an iron key or short wedge and washer on the face of the plate; the under side of the spindle being a trifle larger, gives a shoulder for the lap to rest on, though the pully for driving it (shown on the under part of the table) should be so long as to have its shoulder or upper part come close under the lap, so as to be a steadiment to the lap. The pully of the beach and lap will require turning in a lathe. The driver of the lap, by a hand-wheel marked *c*, is about three inches thick, and twenty-one inches diameter. The pully or sheaf on the lap D is three inches diameter, making seven turns to one of the wheel. If the wheel *c* be of fir, weight it with a bit of lead. The lower centres are formed out of an old flat file; the upper ones are of box. The centre of the spindle D works into a bit of box-wood, driven tight into a hole of the arm marked F; this arm is fixed on the upright standard G, having a chase-mortice, with a set screw to fix it on the back, because you require two laps at any rate, one of lead the other of grain tin; if the lengths of the lap spindles differ, the arm F can be moved to accommodate them. I is a ledge or

6.



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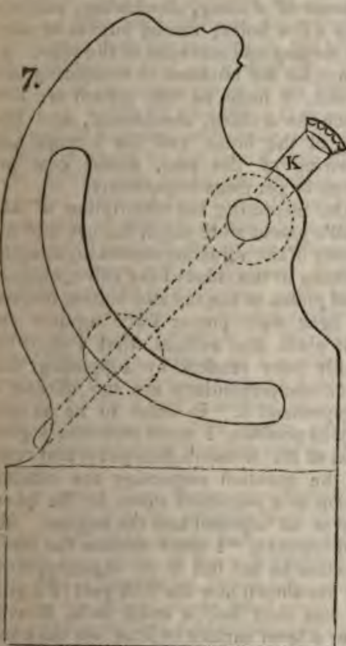


square frame, fixed firm on the table, about two inches and a half high; and as there is a hole in the centre of near four inches for dropping down the pully part of the lap, if the frame is lined with sheet-lead, with a rim standing up round the edge of the hole, one-fourth or near one-half an inch high, it will hinder the emery and water from running away. Some people, to save expense, use putty, but the water runs into the table without lead. H is an iron pin, about $\frac{1}{8}$ in. thick, fixed tight through the table for the quadrant holding the stone to be ground. The part with the hole T (see figs. 6 and 7) goes on to the steady pin H, *and is* taken off *every minute or so, to see* how the work is advancing. The two screws marked J are of beech, with nuts on the front side to tighten them; through these screws there is the handle or taper pin, on which your stone is cemented by a little bees' wax mixed with the rosin, &c. The handle is marked with the letter K, and must fit without shake, and yet not so tight but that it may be twisted round, as required, by the finger and thumb.

The easiest things for an amateur to attempt, after slitting and polishing, are ear-drops, which may be ground by holding the piece between finger and thumb; but, in order that each pair may be alike, a guage of a card or piece of tin, iron, &c., should be used of this form :—

Stones for shirt-pins, seals, rings, knife-handles, &c., will require a light lathe, and tools of the description shown in figs. 8, 9, and 10. Fig. 10 is a seal-engraver's tool, of which every seal-engraving lathe has an assortment of from 20 to 100 of different sizes. Fig. 9 is a tube of tin, fixed firm on the plug of lead, for cutting holes through thin stones. Finger-rings require two tubes; one to cut the larger diameter, and one the smaller, the size of the finger. These holes, as well as seal-cutting, or small holes for fixing on the gold, require to have diamond-powder and oil; a little goes a great way, and is not dear, for polishing stones after ground on the lead lap; the tin lap requires Tripoli and water. (Tripoli is a fine sort of sandstone, to be had at any ironmonger's.) Holes in knife-handles are made with drills of a tin tube, and soldered up the side fixed firm into the leaden plug. The iron tangs, shown in figs. 8, 9, and 10, are about as thick as a gimblet-shank,

cast into the hollow mandril, the lead ends with the shank first held in the middle. After casting as many as required, turn them by holding a file against them, as they are too slight to put a graver to them, without considerable practice. Fig. 8 has a piece of circular copper for cutting ornaments or small mouldings; it would be well to have several such.

The figs. 1, 2, 3, 4, and 5, are all on half-inch scale; but, for the sake of greater clearness, I have represented figs. 6, 7, 8, 9, and 10, as exactly one-half the actual size. The whole of the tools and apparatus are of the cheapest kind, yet will cut and polish work as well as machines of the most expensive sort, though not, of course, so expeditiously as lapidary-mills driven by steam or water.

It may be well to state, in conclusion, for the encouragement of the amateur or young beginner, that when I was on a visit to my brother, some six or seven years ago, on the east coast of England—not far from Scarborough—where quantities of fine pebbles are to be found on the sea-shore, we called on a young clergyman, who had, in his leisure moments, cut and polished a large assortment of beautiful specimens, arranged tastefully with other stones in the rough. It would have delighted the eyes of even Mark Penguin, or any other stone-breaking, wallet-filling geologist, to behold the collection. How many men round the coasts are there that may amuse themselves in the same way in the long winter evenings, especially if two friends join and work together! Wishing to all such every success,

I am, dear Sir, yours, &c.

WILLIAM REED.

Peterhoff, Jan. 1833.

P. S.—I should like to be informed how many lapidaries' shops there are in or about London, and what is their chief work. Are all the diamonds now ground in London, or do they still send the best brilliants to be ground in Holland? In this, Peterhoff Lapidary's Mill (erected in Catharine's time by an Englishman, I am told,) they are constantly grinding small diamonds—urns of agate, porphyry, and malachite, ornamented with gilt and bronze figures—seals, necklaces, and ear-rings, set in gold, of the most tasteful fashion—snuff-boxes, handles for knives, *ladies' jewel-cases, inlaid with malachite; in short, every sort of fine stone-work.*

MR. HALL'S IMPROVEMENTS IN THE STEAM-ENGINE.

"Deeper and deeper still."

Sir,—Mr. T. V. Robson's letter inserted in your Magazine of the 31st ult., compels me to trouble you again, which I should not have done were it not of importance to make the scientific principles of Mr. Hall's inventions as clearly understood as possible.

As far as respects the complexity of the piston, Mr. Robson now admits that it consists only in the *vast* labour and expense of *drilling, shouldering,* and *tapping* a f w holes; but he forgets to men- the *forging* and screwing of the pins. In return for my kindness in reminding him of this, I hope he will inform me how much the *drilling, shouldering,* and *tapping* of the holes, and the forging and screwing of the pins, would cost per dozen or per gross respectively.

On inspecting the description of Mr. Hall's patent slide valve, the use and necessity of the adjusting screws to cause the packing in the sides of the valve, and the steel plates at the top and bottom thereof, to bear with proper force against the seat plate is so evident, that I shall not insult your readers by supposing that their understandings are too obtuse to comprehend it. In order to be as concise as possible, I must pass over a good deal of Mr. Robson's flummery, and come to the question respecting the condensation of a portion of steam by the quantity of oil injected into the engine. Mr. Robson says, "I must decline the investigation he has left to my sagacity, until he has shown how the 80th part of a pint, or less than half a cubic inch, flowing over a level surface of little less than two feet, can form such a stratum as must have been contemplated by the inventor when he said, 'The escape of steam by the working piston and valves is effectually prevented by the uniform and plentiful flow of oil, a stratum of which is formed, and constantly floats on the upper side of the piston, hermetically sealing any passage between it and the sides of the cylinder.'" Now, Sir, although Mr. Robson very liberally says that I am one of those persons "who appear not over nice in what they vouch for," I will tell him, that I know *from experience* (which he, with a few grains of common sense, might have known by merely reasoning *a priori,*) that if a pint of oil per minute (which I consider a

plentiful flow of oil) be injected into a steam-engine cylinder, and its escape between the piston and cylinder sides do not take place except in a trifling degree (as is the case in Mr. Hall's cylinder), then the oil will be collected and remain on the piston, a stratum whereof, more or less deep, will remain according to the distance of the upper steam-way or passage above the top of the piston, when the piston is at the highest part of its stroke. Thus, in Mr. Hall's engine, there is always found, when the cylinder cover is taken off, a stratum of oil of about half an inch deep, because the bottom of the steam passage leading to the top of the cylinder is half an inch higher than the top of the piston when at the highest point to which it ascends. It must be evident to any one, on a little reflection, that this would be the case if even much less than a pint of oil per minute were injected, for even then the oil would accumulate at the top of the piston till it overflowed through the steam passage.

Mr. Robson again bewilders himself sadly about the refrigerating pipes being kept full of water. This I consider to form the great principle of Mr. Hall's invention, with which all his other improvements harmonise, forming a perfect whole, which I feel confident must and will supersede all other steam engines and form another distinct era in their history.

To prove that pipes surrounded by cold water can be actually kept full of water, although steam be constantly entering into them in the way effected by Mr. Hall's apparatus, let us take one of his refrigerating pipes filled with, but not enveloped by, cold water, and then pass a quantity of steam into it at one end, the other being open and connected with the atmosphere. The steam will be converted into water, and continue in that state until the whole within the pipe acquires the temperature of 212°, and a small portion of water arising from the addition produced by the condensed steam will run away at the end opening into the atmosphere. As soon as the water in the pipe has acquired the temperature of 212°, any further portion of steam that afterwards enters the pipe will pass away in the form of steam and not of water; then, indeed, the pipe will not be full of water, but will be partly occupied *by water* and partly by steam; but if the pipe be enveloped in a stream of cold water, then the heat is carried away through the metallic material composing the pipe, and the water, instead of becoming heated to 212°, is carried away at a lower temperature, which is reduced in proportion to the length of the refrigerating pipe. Mr. Hall employs in his engine refrigerating pipes sufficient to cool the water and pass it away at 70°. Now, lest I should be again charged with being one of those persons "who appear not over nice in what they vouch for," I beg to say that Mr. Hall has prepared a glass tube to show the process I have just described, the loan of which I shall request of him to exhibit it to you, Sir, in order to show how far Mr. T. V. Robson is the scientific character he sets up for—how far the epithet *trash* is applicable to this interesting subject—and how far the results of Mr. Hall's inventions are "nonsense," "the height of human folly," &c. &c. If Mr. Ride has not "sufficient ability to know what it is he really does see," I hope that ability will not be denied to the Editor of the Mechanics' Magazine, who shall shortly have ocular demonstration of the disputed point, and who, I trust, will in justice bear his public testimony to the truth of all I have stated in this as well as in my former letters.

Till I came to Mr. T. V. Robson's last paragraph but one, in the letter to which I am replying, I pitied his want of penetration in not being able to comprehend the principles of Mr. Hall's inventions, but in the above mentioned paragraph he displays such ignorance of even the action of the common air-pump of a steam-engine, as must create contempt in every one for the opinions of such a pretender to science. He says, "The true problem to be solved is, not the power requisite to pump a given quantity of water per minute to the height of 33 feet; no, nor in most cases to the height of as many inches." What! when the valve through which the water is discharged into the atmosphere is opened by the water being forced through it, is not the whole pressure of the atmosphere upon the area of the piston, from the moment the water opens and begins to flow through the valve until the whole quantity raised by each stroke of the air-pump piston is discharged—is not this equal to the pressure of a column of water of

about 33 feet in height? Is it indeed only equal to a column of as many inches? Mr. Robson continues, "for could the injection water be got rid of by any other means, the air-pump bucket would still have to sustain such portion of the atmospheric pressure as was due to the vacuum formed in the condenser; therefore the power requisite to work the air-pump, solely on account of the injection water, is simply no more than is sufficient to raise it to the top of the air-pump." Why, Sir, I challenge Mr. Robson to produce another absurdity equal to his matchless assertion that "the power requisite to work the air-pump, solely on account of the injection water, is simply no more than is sufficient to raise it to the top of the air-pump." Let me inform him that if there were no water to be pumped out of the air-pump, the vacuum above the piston bucket would be as good as that below it, minus the deterioration caused by any little air that might get into the engine, and the trifling elastic force of the water resulting from the condensed steam, and that the loss of power arising from both these causes would be an infinitesimal of the lowest order.

To the last paragraph of Mr. Robson's epistle I need not reply, as I could only recapitulate what I have before stated, to which I beg to refer in order to avoid the necessity of adding further to this already long letter.

Intending to supply you shortly with the glass apparatus for showing what actually takes place in Mr. Hall's refrigerating pipes,

I remain, Sir,

Yours respectfully,

JOSEPH RIDE.

Vauxhall Works, Leicester, April 2, 1833.

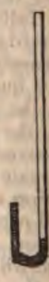
EXPERIMENTS ON THE NATURE OF STEAM.

Sir,—Tables have been published by Taylor, by Ure, and by various other chemists, of the elasticity of steam at various temperatures. Dr. Ure states that an increase of temperature

Of 212 degrees ....is requisite to form steam = 30 inches mercury.
Of 36 degrees (from 212 to 248) to form steam = 30 inches ———
Of 24 ——— only (from 248 to 272) to form steam = 30 inches ———
Of 18 ——— only (from 272 to 290) to form steam = 30 inches ———
Of 15 ——— only (from 290 to 305) to form steam = 30 inches ———

M. M. Dulong and Arrago, in a table published some time since in your useful Journal, carry their observations to 50 atmospheres—and state that towards the end of their observations the difference of about a single degree of heat increased the elasticity of the steam one atmosphere = 30 inches mercury. Now if this amazingly increased effect could be obtained by such a trifling addition of heat, an immense advantage would be derived from the employment of very high steam—and as these tables have probably been the foundation of the wonderful delusion that has been prevalent for some years on this subject, and which has probably prevented the improvement of the steam engine—if it is susceptible, and the writer supposes it is susceptible of improvement—I propose describing two sets of easily repeated experiments, which will shew clearly the real nature of steam, and the futility of expecting advantages from the use of steam of great elasticity; with a few further remarks on the nature of *heat, which I think* will finally determine *that it is an element.*

First, provide a leaden cylindrical boiler, about 3 inches diameter and 12 deep, nearly filled with dilute sulphuric acid—diluted with water till it will just boil at 300°. Next provide a stout barometer tube, seal one end of it, and bend the tube at six inches from the sealed end, thus; and fill the bent and sealed end with mercury, and also one inch of the strait tube; then pass a small bubble of water through the mercury to the sealed end. Now suspend the tube a convenient height, and insert the lower end in the leaden boiler; cause the dilute acid to simmer a few minutes, and the bubble of water, expanding into steam, will expel the mercury from the sealed end of the tube, and the water will be all expelled also, except a small portion, which, converted into steam, remains in and occupies the sealed end of the tube, compressed by a column of 7 inches mercury



in the longer end of the tube aided by the atmospheric pressure of 30 inches. The steam then remaining in the tube is of just sufficient elasticity to balance 37 inches of mercury, and in just sufficient quantity to fill the lower sealed end of the tube.

Now, keeping the heat constant, cementing other similar barometer tubes to the longer end of the first tube, and adding successively additional columns of 37 inches mercury; we shall find that doubling the pressure compresses the steam into one half its former volume, trebling the pressure into one third its volume, quadrupling it into one fourth its volume. We shall find also, on removing or repeating these pressures, a corresponding increase or diminution of the volume is visible, if the boiler is withdrawn a few moments for inspection of the sealed end of the tube.

I provided a small wooden cistern, with ten or twelve feet of small leaden pipe, coiled spirally on the bottom, the ends of the pipe passing through and cemented at opposite sides of the cistern; the upper end of the pipe, connected with a stop-cock, was inserted in a high pressure steam boiler, in which the steam was of the elasticity of 60lbs. per square inch. About a cubic foot of cold water was placed in the wooden cistern, and its temperature observed; the steam was then allowed to distil through the leaden pipe, till a pint of water had condensed; on examining the cubic foot of water in the cistern, it had acquired an increase of 20° in temperature. On distilling over a second pint of water, the water in the cistern acquired an additional temperature of 20°, and when the steam in the boiler was reduced in elasticity to 30lbs. per square inch, a pint of water, on being distilled over, raised the water in cistern 20°, as at first. When the steam in the boiler was of only one pound per inch above the atmospheric pressure, the distilling over a pint of water raised the temperature of the water in the cistern 20°, as at first. Thus it appears that the steam, under all pressures and temperatures, is the same invariable quantity of water and of heat.

Now steam is only one of four distinct compounds of a constant quantity of oxygen and hydrogen, with variable quantities of heat or caloric; and as the heat differs not only in *quantity, but in* its affinity also, in each separate state, we shall proceed to detail its relations under atmospheric pressure.

In the *first* state, that of ice, it is a crystallised solid, holding but little heat, which appears free to enter or depart with every variation of temperature; for the heat is always sensible to the thermometer, until the ice begins to melt at 32 degrees, in its transition to the

Second state—that of water. The fluid shows only $\frac{9}{10}$ the volume of the ice, and, during the process of melting, 140 degrees of heat are absorbed imperceptible to the thermometer. If the atmospheric pressure be now withdrawn, the water and heat will immediately assume the state of vapour, or

The *third* state of steam, which we have seen increases in heat in some proportion to the pressure. When of the elasticity of 60lbs. per inch, it is expanded into 430 volumes by the combination of one volume water with 1180 degrees of heat, the thermometer indicating only 290 degrees. If the steam is expanded into 1720 volumes, its elasticity is 15lbs. per inch, its heat 212 degrees. If the steam is expanded to 25,800 volumes it is only $\frac{1}{11}$lb. elasticity, and of heat 102 degrees. Yet we have seen, by experiments, that the actual quantity of heat and water is in all cases a constant quantity.

Although a considerable portion of the heat is so combined with the water as to be inappreciable by the thermometer, yet the heat seems to have little, perhaps no permanent, chemical affinity for the water; for it quits the water instantaneously if any other colder substance is brought in contact with the steam, and it cannot remain in combination with the water as steam, if all pressure is removed from it.

In the *fourth*, or gaseous state, a volume of water enters into chemical combination with upwards of 6,000 degrees of heat, expanding into nearly 2,000 volumes of permanent gases at atmospheric pressure; and this heat is so combined as to be insensible to the thermometer—insensible to any degree of cold or of moderate heat; exhibiting, in these changes of temperature, combined or latent heat, and uncombined or sensible heat, in a state of the most intimate mixture but at the same time as distinctly separate as if they were mere mixtures of the

particles of two dissimilar elementary bodies. I do not believe that this wonderful composition or mixture has ever yet been noticed. This chemical combination of heat and water can be instantly separated by sudden violent compression; but this is no argument against its chemical constitution, for I have shewn that the same evolution or separation of intense heat may be effected by the collision of flint and steel under water, and no one can doubt the chemical union of heat in those substances. The separation of heat from such dissimilar substances, proves that heat in combination can be separated by compression. The fact of heat being evolved by compression, as also by percussion and friction, is indeed so familiar to every one that it has induced the superficial notion that heat is generated by compression, by percussion, and by friction; although I have already shewn, in my former communications, that the heat is not produced by the mechanical operation, but always the result of chemical action.

As this chemical decomposition of the gases has been effected by slow combustion, and the latent heat, thus combined with one cubic inch of water, separated and ascertained to be sufficient to heat 32°, and to convert into steam of atmospheric elasticity more than five cubic inches of water, those chemists who assert that heat is mere motion, should inform us how such an enormous quantity of motion can be insensible, while the comparatively trifling motion amongst solid particles of ice is free to act on the thermometer; and why motion in the fluid water, although much greater in quantity, is insensible just to a certain degree, and then again perfectly sensible? And if all those chemists who assert that heat is mere motion, either teach or allow that heat is latent in this compound gas, and, in so doing, assert of course that latent heat is latent motion, let these chemists define active motion, and wherein it differs from this latent motion of their's, that converts, maintains, and expands one cubic inch of incombustible water into 2,000 cubic inches of permanent elastic gases of the most combustible and inflammable nature. Let them also describe the nature of the compounded active motion and latent motion.

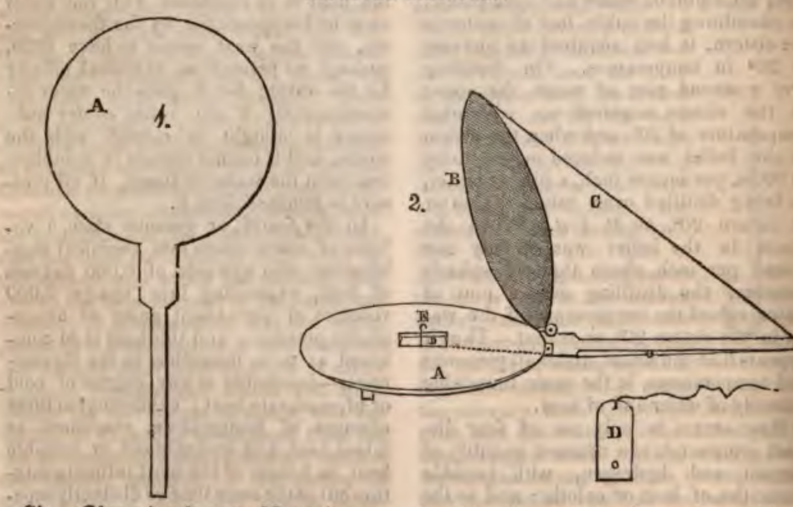
Until this is done, let us consider heat to be an element, and as the most wonderful of all the elements so bountifully created for our use and contemplation.—In my next I will endeavour to describe some of its leading properties.

I am, Sir,

Your obliged and humble servant,

C. M.

IMPROVED BIRD-TRAP.



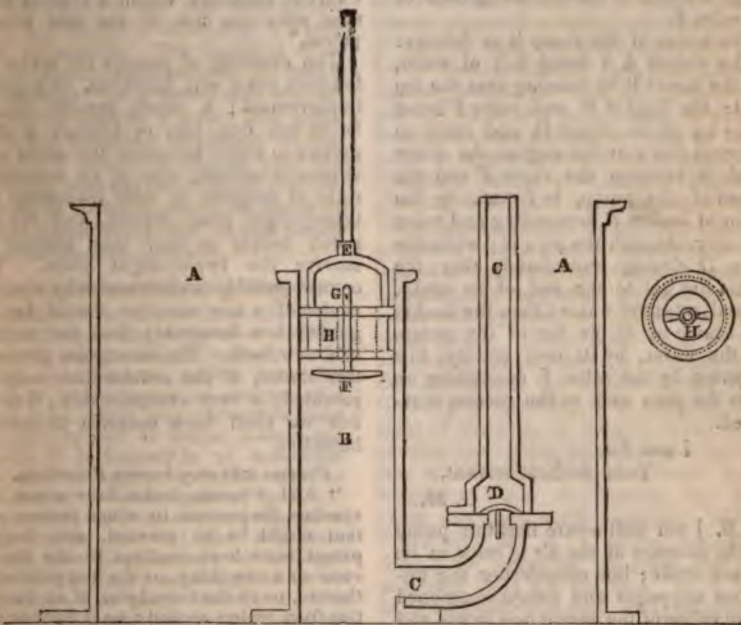
Sir,—Observing in your Magazine an inquiry for a trap to take birds without hurting them, I send you herewith a sketch of one which I have contrived for

myself, and which I think will be found to answer the purpose. Take a piece of board, half an inch thick, and cut it into the shape represented in fig. 1, the circular part being ten inches diameter, and the shaft ten inches long. Procure a ring of strong wire (B, fig. 2,) the size of the circular part A, and fill in with silk net or green gauze; then fix this to the board by means of a common roller and spring. Attach a string (C) to the gauze cover B, pass it through a staple at the end of the trap shaft, and continue it under the trap to the centre of the circular board, where it should terminate in a small piece of brass D, about the size shown in the separate sketch. E is a peg of hooked wire, which is inserted loosely into a hole in the end of the piece of brass, and a corresponding one in the centre of the board. The bait is fixed on this wire, and cannot well be pecked at or removed without unfixing the peg, setting the brass piece at liberty, and instantly bringing down the gauze cover on the unfortunate forager.

I am, Sir,
Your obedient servant,
W.

Peterborough, March 21, 1833.

HOT WATER PUMP.



Sir,—Being a constant reader of your valuable Magazine, and having received much information from the same, I have taken the liberty (knowing your readiness at all times to oblige correspondents) of soliciting your permission for the insertion of the following plan of a hot water pump. When we consider the many accidents arising from steam boilers bursting from the want of water (though at times from other causes) it will be *found* highly *necessary that some plan should* be devised to remedy the evil above complained of. The plan I am about to submit to your consideration is by no means a difficult one, but such a one as I think would be of much service to my fellow mechanics. The description is as follows:—

A A is a square or oblong cistern of cast iron, or any other suitable metal to contain the pump, but must be deeper than the height of the pump and be constantly kept full of water.

B is the barrel of the pump (I shall not

say any thing about the proportions of it), truly bored, and is to be fixed to the bottom of the cistern.

C C is the outlet for the water contained in the pump to the boiler.

D is a valve fixed in the elbow of the pipe C C to stop the water from coming back to the barrel again by the pressure of the steam on it from the boiler.

E is a valve or bucket, such as used in other pumps, and to be packed with hemp or any other suitable packing in the groove H, made to receive it, with the exception of the spindle valve F inverted, and is kept from falling through by a pin placed in the hole G made in the spindle to receive it.

H is a section of the valve E, with a bridge across it to receive the spindle of the valve F.

The action of the pump is as follows: —The cistern A A being full of water, fills the barrel B by running over the top of it; the bucket E and valve F being at the top of the barrel B, and ready to be forced down by the engine, the water which is between the valve F and the bottom of the pump, is forced, by the action of bucket E descending and valve F closing, through the pipe C; while the valve D closing immediately that the bucket has got to the end of its stroke, stops all return of water; then the bucket E is drawn up to the top of the pump, and the water, by its own gravity, fills the pump by the valve F descending as far as the pin; and so the process is repeated.

I am, Sir,

Your obedient servant,

G. M.

N.B. I am well aware that this pump has the pressure of the air to resist in its upward stroke; but considering the numerous stoppages and delays occasioned by the valves of the pumps now in use, and the uncertainty of their action, I think the pressure of the air in this is but a minor consideration when compared with the other.

MR. GODSON'S BILL FOR THE IMPROVEMENT OF THE PATENT LAWS, WITH REMARKS.

"*Preamble.*—Whereas it is expedient that the laws respecting letters patent for inventions should be explained and amended, *be it therefore enacted*," &c.

Patents to be Granted for Seven or Fourteen Years.

"That, notwithstanding any law or custom to the contrary, his Majesty is hereby empowered to grant letters patent for the terms of seven years or fourteen years, as is hereafter expressed and enacted, for the sole working or making of any manner of new manufacture within the realm of England, to the inventor or inventors of such manufactures, which others at the time of making such letters patent shall not publicly use in England, so as they be not mischievous to the State; provided the said person shall particularly describe and ascertain the nature of the said invention, and in what manner the same is to be performed, by an instrument in writing under his hand and seal, and cause the same to be enrolled in the High Court of Chancery within a limited time next after the date of the said letters patent."

The granting of patents for seven or fourteen years will, doubtless, be a great improvement; a much greater would be to say five, ten, or fifteen; a still greater to allow inventors the same privileges as authors, that is, an *assignable* right of property in their inventions for twenty-eight years certain, and for as much longer as they may happen to survive the twenty-eight years. We cannot possibly understand why the inventor of a new machine should be regarded less favourably than the author of a new book. The description given in this clause, of the articles that may be patented, is very exceptionable; but to this we shall have occasion to advert hereafter.

Persons who may become Patentees.

"And whereas doubts have arisen respecting the persons to whom letters patent ought to be granted, and letters patent have been confined to the discoverer of a new thing, or the first publisher thereof, or to the introducer of an invention from realms abroad; be it further enacted, that in addition to the above classes of persons, letters patent may be granted to any person in Great Britain and Ireland who may have received from any person being abroad, or from any person being resident within the kingdom, information of any new manufacture whatever, so that he may have the said letters patent in his own name. And be it further enacted, that any person in Great Britain and Ireland may communicate or sell any invention that he may possess unto and to any person whatever, who may and shall be at liberty to obtain let-

atent in his own name, provided the letters patent shall contain a recital he said invention hath been commu- d or sold to the person in whose the said letters patent are granted."

e do not see any good reason for the tion here proposed to be made in tisting law, and think it might be ctive of a great deal of vexation njustice. If a person who commu- s "information of a new manufac- to another person, does not himself e to take out a patent for it, why l that other person be entitled to ? What right can *he* possibly ad- to the thing? The person who him the information may himself had no right to the invention; he iave derived his knowledge of it from third person, and that third person a fourth, and so on, through a whole of gossips. The payment of a for the information does not much the case; for a person may buy an ng as well as a new. We think every necessary relaxation in the ng law would be effected were the dual, who has the original right to ent, at liberty to take it out either in vn name *or in that of any person sons nominated by him.*

at shall be the Subjects of Patents.

And whereas doubts have arisen re- ing the new manufactures or subjects hich patents ought lawfully to be ed: and whereas doubts have also as to the extent of the use of a facture, which may prevent its being wful subject of letters patent: and eas it is impossible to enumerate kind of manufacture which ought to otected by letters patent; be it fur- nacted, that all new substances or s made; that all new machines; all new combinations or arrange- of machinery or things, either al- known or newly discovered; that rinciples newly discovered, and all applications, which, when reduced ractice, produce some article fit for that all chemical discoveries, me- , or process, which result in or pro- an article of commerce, shall be the cts for which letters patent shall be ed, whether they be discovered with- e United Kingdom of Great Britain reland, or be obtained by communi- or sale as aforesaid. And be it fur- nacted, that the letters patent shall ecome void, although the manufac- nay have been *used in any particular f the United Kingdom of Great Bri- nd Ireland for* which the letters pa- tent may have been granted, either pri- vately or in an imperfect manner, or has not been practically used in a public man- ner within the last ten years prior to the date of the said letters patent."

The alterations proposed to be made by this clause are of tremendous import. Every body who has "privately" exercised any particular art or process which ano- ther may think it worth while to take out a patent for, will be liable to be despoiled of the privilege of using it without the interloper's permission; even the original author of an invention may himself be obliged to purchase leave to use it from some one who has no earthly right to it, beyond what impudence and trickery have given him. The public, too, will not only be liable to be robbed of as many of those inventions, to which it has already acquired a right by abandonment or lapse of time, as may happen not to have "been practically used in a public manner within the last ten years," but will be excluded in all time to come from ever establishing a common pro- perty in newly-invented instruments or machines, except on condition of never allowing them to be ten years out of use. Were the law altered in the manner here proposed, there would instantly be a *general scramble* after all secret, obscure, forgotten, or neglected processes, and much robbery both of individuals and of the public. Hitherto the king, as re- presenting the community at large, has been considered the *ultimus hæres;* Mr. Godson's proposition is to transfer the right of heirship, as regards inventions, to every speculating knave who, by prying into workshops, bribing of servants, rum- maging of books, or otherwise, can dis- cover any thing worth patenting, which "practical use in a public manner," during the preceding ten years, has not protected from his clutches. It is not to be supposed that such an *improvement* as this will ever be sanctioned by the legislature. The chief motive, we believe, which has suggested it, is a consideration of the hardship which is experienced when a person takes out a patent for something which he believes to be new, but finds afterwards that it was well- known during some former period not within the range of his experience, or is actually practised at the time in some quarter of the country with which he is not acquainted. But is the hardship which any individual can experience, from not being permitted to make a

fortune by inventing old things over again, to be put in competition with the loss which the community might experience from having its common rights of property thus infringed? The discoverers of things known before are, to be sure, a very numerous class, but not, to our minds, deserving of any particular commiseration; they suffer from being ignorant, and that is all. Another reason for this projected change in the law may have been the risk of public disclosure to which a person is at present exposed while making the preliminary experiments necessary to the perfecting of an invention, or the preliminary revelations necessary to secure the assistance of some moneyed person in taking out a patent; but instances of fraudulent forestalling from this cause are extremely rare, and, were they even of every day occurrence, it would scarcely be fit that the whole frame of society should be disturbed in order to prevent them. Every inventor who seeks to secure to himself so important an advantage as a monopoly of a useful invention for a long period of years, should be well content to encounter some risks for the sake of it.

Were even that part of this clause which has called for these observations expunged, it would still stand in need of very considerable amendment. Mr. Godson has been at great pains to specify generically (if we may be allowed the expression) the different sorts of things which ought to be the subject of a patent; but we can by no means compliment him on his success. We think the phrase of the old statute of monopolies, "any manner of new manufacture," much better than all the verbiage he proposes to substitute, not only because of its brevity, but because of its perfect exactness. *Nothing* ought to be the subject of a patent which is not some "manner of new manufacture." Mr. Godson proposes that "*all principles newly discovered*, and all applications which, when reduced to practice, produce some article fit for sale," shall be fit subjects for patents; but the former branch of the provision would recognise in individuals a right to what is the common property of all mankind. The "article fit for sale," and the *manner* of producing it, are the only things to which an inventor can have a right; the "principles" which led him to to its manufacture, whether "newly discovered" or known of old, are simply laws of nature, which a man can no more appropriate to himself than he can appropriate light or darkness. Sir Humphrey Davy's safety-lamp would have been a valid subject for a patent, but not so the *principle* on which it depends, that flame will not pass through wire gauze, nor any other similarly apertured fabric.

Secondary or Remedial Specifications to be allowed.

"And whereas it often happens that omissions are accidentally or unintentionally made in the specification of an invention: and whereas it often happens that the patentee discovers some improvement upon the subject for which the letters patent have been granted, and he is deterred by the great expense thereof from taking out new letters patent for the said improvement, which is often lost to the public; be it enacted, that it shall be lawful for the said patentee to make and enrol a specification or specifications supplying those omissions or including those improvements. And be it further enacted, that such second or third specification shall bear a stamp duty of pounds: provided always, that such secondary specification be made before any suit at law or equity be depending, either to cancel or uphold the said letters patent."

We see no objection to such secondary specifications; but we think it should be provided that they shall not have the effect of extending the term of the original patent. Where an improvement is of importance enough to make it worth while to have a monopoly of it for a separate term of years, it must always be worth while to take out a separate patent for it; more especially should "the expense" be lessened in the manner proposed by this bill. Were every secondary specification to confer a right to the improvement included in it, for a new term of fourteen years from the time of enrolling it, inventors would be tempted to keep back as much as they feasibly could in the first instance—to dally with the public curiosity up to the last moment of safety—and only to specify fully when the danger of being anticipated became imminent. A patentee might even contrive in this way—specifying every now and then some new addition, but never all that he knows, and always what is least worth knowing—to keep the public for a whole lifetime, if not for ever, unacquainted with the real nature of his invention.

ts Bad in Part not to be wholly Void.
And be it further enacted, that if the t and specification be bad in law as rt thereof, they shall not be bad in s to the remainder thereof respec-, and that the said inventor shall be d and is hereby required, upon the on of any court of law or equity he same is bad in law in part, to en- nother specification thereof, which be written on a piece of parchment ng a stamp of pounds. And as many letters patent have been red to be void, and great expense oss of labour have arisen from the rules by which the name or title of vention in the letters patent, and the ption of the invention in the instru- called the specification, have been ued; be it enacted, that the court or before whom any proceedings at r equity may be taken upon any let- patent, shall have power and are y authorised to amend the title or ication in all matters of form or de- ion which could not have misled any ns acquainted with the subject of."

e object of these clauses is to rectify we know is generally considered to e of the worst features of the exist- ystem—namely, the strictness with n patents are interpreted. A patent nted to a person on a representation he has invented three things which all new, and because it turns hat two only of them are new, he for- his right to the whole; or he takes patent for a new steam-engine, and describes in his specification a new -boiler, wherefore it is held that condition on which the patent was ed has not been complied with. It possible to deny that considerable ship may occasionally arise to indi- ls from this close adherence to the of the record; but we do not think due consideration has been given to manner in which the interests of the c would be affected by a relaxation e practice. All monopolies are pro- ed by public policy, and the only nd on which patents for new inven- are excepted from the general ription, is that by consenting to give nventor of any new and useful manu- re a monopoly of it for a limited d, you may obtain from him, as the of the privilege, a fuller disclosure e invention than *you might other- ever obtain. The number of secret st inventions was formerly* an evil of great magnitude; the practice of granting patents was introduced to lessen that evil, and it has undoubtedly lessened it greatly. But to secure that fair and full disclosure which the good of society requires, it is essential that there should not only be as little facility as possible given for evasion or concealment, but that every thing of the kind should have pains and penalties, more or less severe, attached to it. We may be very sure that patentees will always keep as much back as they safely can, and we can imagine no way in which this can be so well prevented as by dealing with them according to the letter of the paction which each makes with the public. If the alterations now proposed are adopted —if a patent may be bad for nine out of ten things included in it, and good for the tenth—the effect will inevitably be to introduce a degree of laxity in specifications quite destructive of that full and fair disclosure which is the object sought by the public. Patentees will not care what they specify; they will specify as many things as they plausibly can, in order to involve the real thing in as much obscurity as possible. The case of Arkwright is one strongly in point. In his patent of December 16, 1775, he specified ten different things as necessary parts of his spinning machinery, some of which were of no use at all, and others worse than useless; and this he did, as he afterwards admitted, expressly for the purpose of mystification. In consequence of this, his patent was very justly set aside; but had the law been as it is now proposed to make it, the patent would have been a good patent in spite of all the deceptive representations on which it was granted. And so it would hereafter be, in nine cases out of ten, were the existing law altered: there would always be a great many more things introduced than the patentee has any right or pretensions to; you would invariably have the needle to seek in a bottle of hay, and might not always, if the practice of lodging secondary specifications is adopted in the manner proposed, be sure of finding it.

(To be concluded in our next.)

THE UNDULATING RAILWAY.

Sir,—I should not have considered it worth my while to have noticed the letter contained in your last number on the subject of "*the undulating railway*," and

signed "Junius Redivivus," had it not been accompanied by some remarks of your own, which I feel it necessary to reply to.

As an occasional contributor to your publication, and as a constant reader of it from its commencement, I feel little doubt of your doing me the justice to publish this letter with as little delay as possible.

I am the inventor and patentee of the undulating railway, models of which have recently been exhibited at Manchester and in London, and (however extraordinary it may appear to your correspondent) have engaged the anxious attention and investigation of some of the most scientific men in this kingdom; men who, instead of adopting the ungracious and undigested conclusions of "Junius Redivivus," have not considered it a waste of time to endeavour, by formula, diagram, and figures, to resolve the facts which impartial experiments on a small scale have so fully developed.

To convince you, Sir, that I am not an individual who, as "*a plotter of absurdities*," wishes to impose upon public credulity, I have not hesitated to risk any mechanical reputation which I may have earned, by publishing a treatise on the subject of the railway in question, a copy of which I had requested my publishers, Messrs. Sherwood, Gilbert, and Piper, to send to you. In the short work alluded to, I have ventured upon a mathematical explanation of the cause of the advantage derivable from the adoption of *undulating* instead of *horizontal railways*. To that reasoning I beg to call your attention, and in the mean time permit me to assure you that I shall not for one instant defend a fallacy, if any of your correspondents will undertake to establish one. I cannot, however, bring myself to believe, although some "*barren spectators*," as your correspondent terms them, may be inclined to found their faith on the empty assertions of "Junius Redivivus," adorned as they are by corresponding remarks on "ice hills," "Russian mountains," "polished fly-wheels," "perpetual motion," "new fashioned water-wheels," &c. &c., that such arguments will in any degree satisfy the inquiring minds of the great number of scientific men of declared reputation who *have witnessed* the experiments—who have *considered them worthy of reflection*—*and who, as yet, have not* made me acquainted with *the error* into which, if your opinion and your correspondent's be correct, I must (very innocently, I assure you,) have fallen.

I have recently requested the model engine to be returned to the Adelaide Rooms in London. You will, I hope, do me the honour to examine the experiments carefully, and if you find that a much greater velocity is attainable upon an undulating line with a given power than upon a horizontal line with the same power, and that greater weights can be conveyed upon one line than upon the other, I trust to your candour to make such declaration, or to show mathematically wherein the deception or fallacy consists.

"Junius Redivivus" argues as if I talked of *generating power* upon an undulating line. It is enough if I prove that *it can be economised*, or that greater loads can be carried, and a greater velocity be attained, than upon a horizontal line *with equal locomotive power*.

I should indeed be less deserving than I feel myself of the compliment paid me, in your *autographical plate*, by the enrolment of my name among the names of men with whom I never felt that I merited such an association—and as a *civil engineer*, a most unworthy member of the profession which I have recently embraced, were I to endeavour, first to palm a fallacy upon the public, and afterwards to insult science by endeavouring to establish that fallacy by false reasoning.

By way of rendering your correspondent, however, a little more instructive to your readers, I will beg him to inform them—

1st,—What would be the difference in friction between a carriage of any given weight, say one ton, traversing a curve 100 yards in extent, whose descending and ascending lines incline from the summit level at an average angle of 22½°, and upon a horizontal line of like surface, drawn direct from summit to summit?

2dly,—What would be the difference in the velocity, or (in other words) in the time, which the same body would require to traverse such curve and such horizontal line, supposing it to commence upon the latter at a *maximum* velocity of five yards per second, and to commence the descending line and mount the summit of the ascending line of the curve at the same velocity?

When these questions are answered

satisfactorily to your scientific readers, I will enter further into the practicability of my plan, and I hope I shall not find it difficult to prove that the adoption of a succession of curves upon a railway, whose summits are of equal altitude, for the purpose of saving power by the more economical use of steam, and increasing velocity, is not the only useful object of my invention—but that it especially applies to the rising of inclined planes, and to the prevention of excavation and embankments in many instances; while by the adoption of even occasional *single curves* the carriages may proceed under or over public roads, canals, &c. which might otherwise prove serious obstacles to railway lines, and across valleys, which might also prove sources of immense expense.

The esteem with which I have always regarded your useful publication, induces me to take a trouble on this occasion which the unceremonious, and occasionally uncourteous, remarks of your correspondent "Junius Redivivus" do not, in my opinion, merit. If he can, however, *prove* the fallacy under which I labour, he will not be doing a greater service to the public than to,

J. W. N. BADNALL.

P.S. The line of road upon which, through the kindness of Mr. Giles, the engineer, I hope first to try the practical effect of my principle, whether on the level or up inclined planes, is the Newcastle and Carlisle railway. The result will, I have no doubt, prove that the Rainhill and Sutton inclined planes, which are now the leading obstacles on the Liverpool and Manchester line, may be ascended with a facility which has not hitherto been contemplated.

[We have not yet received the explanatory pamphlet to which Mr. Badnall alludes, nor have we yet had an opportunity of seeing the model of his invention in operation. We can, therefore, say nothing at present either by way of retractation or confirmation of the opinion we have expressed on the subject. When we gave that opinion, we were not aware that Mr. Badnall was the patentee of the "undulating railway;" and we must freely confess that if any one thing could shake our incredulity respecting it more than another, it would be the circumstance of its having a gentleman of his talents, information, and experience for its *author*.—ED. M.M.

MR. BABBAGE'S NEW COINAGE.

Sir,—I must confess I was much astonished at perceiving, by the last number of the Mechanics' Magazine, that you persist in maintaining the fallacy of the preceding number, as to Mr. Babbage's new system of coinage—or rather that, while you shift the burthen of confiscation from the shoulders of the receiver to those of the payer, you still contend that there *is* confiscation in the matter. I thought I had made the contrary so plain, that no one, "however confused in his ideas," could have passed seeing the truth. You, however, with an editorial unwillingness to allow the possibility of your having been in the wrong, have brought forward a baker of penny loaves, to bolster up *the remnants* of your original proposition. He would have, it appears, to sell 25,000 penny loaves to discharge a debt of 100*l.* under the new system, when 24,000 would have sufficed under the old. True—but would any baker on this earth, after pence had been reduced in value a halfpenny in the shilling, be silly or patriotic enough to make his penny loaves of the same size as before? Would he not take care to reduce them so that 25,000 of the new should be equal in quantity to 24,000 of the old?—Certainly! Most of our London bakers come too far north not to be able to take care enough of themselves for this. If they were inclined to act as you think they would, I should propose to enact that there should be a hundred pence in the shilling, when they would *doubtless* give us 100 loaves, as large as they are now, for the same coin which used to buy but twelve: this would be a great relief to the poor!

You say I give up the whole question, when I admit that, under certain supposed circumstances, the present holders of copper would be mulcted to the extent of 4 per cent. This I must totally deny. If (as I suppose Mr. Babbage would have it) the present copper coinage should be called in, and a smaller issued, there would be no loss whatever (beyond the expense of coining). But even if an act of parliament were passed to-morrow, ordaining that, for the future, "every shilling should pass for twelve pence and a halfpenny," without calling in or altering the copper coinage at all, the only losers would be those who then had copper money in their possession, who would evidently have to pay twenty-five pence

where they had received but twenty-four. But this loss would be only *for once*. When the copper in circulation had once changed hands, there would be *no further confiscation whatever*. To make this quite plain, let us take a case. The day before the passing of the act, a man changes two shillings for pence—he receives of course twenty-four; the day after, he wants silver again, but he finds he must now give the twenty-four pence, and another penny into the bargain for his two shillings. Here, however, his troubles are at an end, for if he wants pence again for his silver, his two shillings will procure him twenty-five. Is this loss, of somewhere about four per cent. on the amount of copper in circulation, any thing like the loss of four per cent. (by payer or receiver, which you please,) on every payment made under every existing contract, during the whole time of that contract, whether of twenty pence or twenty thousand pounds? Is this giving up the whole of the argument?—Besides, after all, it is only by effecting the alteration in a certain way, which I have not advocated, that this confiscation is brought about at all. Issue a new set of coppers, giving every holder of twenty-six old pence, twenty-five new ones, and the difficulty is done with. As to all payments, of whatever amount, being somehow or other made in pence, I must confess I do not understand how that can be: I should like to be enlightened. You state that you gave insertion to my last, not on account of the cogency of its arguments, but out of respect for the writer: I hope this will appear in your pages on both those accounts, as well as on a third—respect for yourself. Its appearance will serve to shew that even editorial comments are open, in the Mechanics' Magazine, at least, to animadversion and correction.

I am, Sir, &c.

F. H.

We see nothing in the matter of this rejoinder to justify the exceeding confidence of manner which distinguishes it, or which should induce us to change the opinion we have expressed on the subject. Our friend F. H. makes good his position simply by confounding one period of the operation of the projected change with another. There can be no *question that matters* would ultimately *adjust themselves to this* change, as well *as to any other; but there* must be one period of the change, namely, that of its *first* introduction, and *before* such an adjustment has taken place, when it must of necessity operate to the prejudice of one or the other party in all contracts. F. H. asks whether "any baker on this earth, *after* pence had been reduced in value a halfpenny in the shilling, be silly or patriotic enough to make the penny loaves the same size as before?" We beg our readers to mark the *after*—it is there the whole fallacy of F. H.'s argument lies: the question is not what effect the change will have on *after* transactions, but transactions finished and complete at the time of its coming into operation. F. H. admits that there would be a confiscation to the amount of four per cent. on the whole of the copper money in circulation, but he will not allow that it would affect in the least any payments not made in copper. Now, since the case of the baker has not convinced him of the error which he is under here, we shall present him with another. A. B., a newsman, is under a contract to purchase 50 dozen = 650, of the Mech. Mag. weekly, for one year certain, for the sum of *5l.* When he sells the entire number by retail, he makes at the present time a profit of 750 pence, which he can convert into 62 shillings and sixpence, or three sovereigns two shillings and sixpence. But were the value of the penny to be changed, as proposed, he could only obtain for his 750 pence of profit, 59 shillings or two sovereigns and 19 shillings (× ten-pence three farthings,) while his obligation to pay the publisher the *5l.* would remain the same as before. For as long therefore as his contract might have to run, he would lose by the new order of things four shillings and two-pence on every payment of *5l.* Can F. H. dispute this? and if not, is there not an end to his objections.—Ed. M. M.

INTERIM NOTICES.

"Medicus"—Dr. Keil's remarkable application of magnetism, as a medical agent, will form the subject of a paper by Mr. Booth in our next Number.

Communications received from Mr. Merryweather—Mr. Murray—T—Mr. Dewhurst—Aerostaticus—Mr. H. Weekes—Mr. C. Taylor—Iota—A Scribbler.

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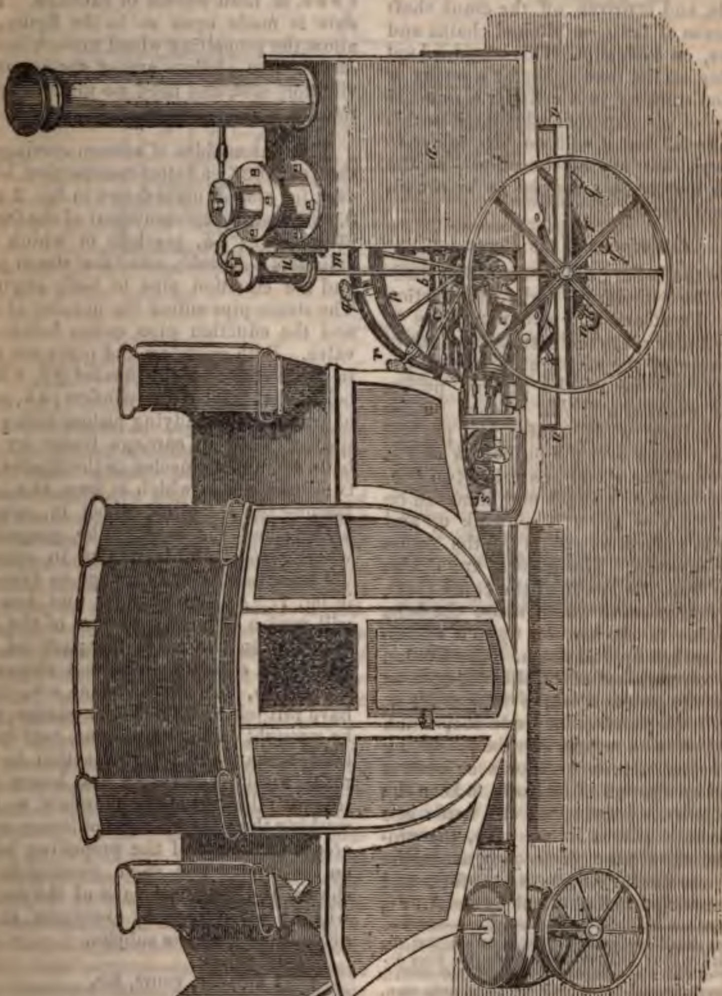
SPRING STEAM-CARRIAGE FOR TRAVELLING ON COMMON ROADS



SPRING STEAM-CARRIAGE FOR TRAVELLING ON COMMON ROADS.

The steam-carriage represented in fig. 1 of the accompanying sketches (in isometrical perspective) has the advantage over every other in this respect; that it is supported on springs in as complete a manner as any carriage drawn by horses. The wheel for propelling the carriage is placed in the centre, betwixt the hind wheels, and is driven off the crank shaft by means of belts, or pitched chains and pullies, on each side. This wheel is kept pressing on the road either by a spring or a piston working in a cylinder connected to the boiler. Another advantage in this carriage is, that it will do less injury to the roads than any of the others, as the wheels may be so arranged as to run in different tracks.

Description of the Parts.

a, is the boiler; *b*, the steam-pipe leading to the cylinder *c*; and *d*, its eduction pipe; the steam and eduction pipes to the cylinder *e*, are not seen on account of the frame of the carriage; *f*, one of the cranks; *g*, one of the pitched pullies in the crank-shaft; *hh*, pitched pullies on propelling wheel shaft; *iii*, pitched chains passing over the pullies *hh* and *g*. The propelling wheel shaft has two friction pullies (one on each end, flanched on both sides) to allow it to work up and down in grooves as guides in the frame of the carriage. The grooves are circles drawn from the centre of the crank shaft, as any other curve would cause the belts or chains to slacken or tighten as the shaft worked up and down. The friction pully on this end of the shaft is seen at *k*, and the guide it works into at *ll*; *n*, the cylinder; and *m*, its piston rod, which is packed so as to pass over the propelling wheel and act on gudgeons or centres turned on the end of its shaft, to keep the wheel always pressing on the road: one gudgeon is shown at *o*; *ppp*, the propelling wheel; the pieces *qqq*, act on the road in a similar way as horses feet, and are connected to the wheel by rods* *rrr*, which have ball and socket joints on outer ends, and joints to allow a small lateral motion at the parts where they join the rim of the wheel; when the pieces *qqq* are off the road, the springs restore the rods to their radial position if they have taken any lateral position by the carriage turning or otherwise; *s*, the boiler pump rod; *t*, the water tank; *uu*, one of the springs for supporting the axis, *vvvv*, of hind wheels of carriage. The axis is made open as in the figure, to allow the propelling wheel to work inside of it. The engines are of the common vibratory sort, and need no more description.

This was my idea of a steam-carriage in the year 1827; a better construction, however, for *general use* is shewn in figs. 2 and 3, where *aaaa*, represents part of the frame of carriage; *bb*, brackets in which the cylinders *dd* work; *eee*, the steam pipe and the eduction pipe to both engines. The steam-pipe enters the nozzles above, and the eduction pipe enters below the valve. Both cylinders and pipes are cast in one piece, and the bracket *gg*, *hh*, is bolted on the end of the cylinders; *hh*, parts of bracket for steadying piston rods; *ii*, springs (fixed in carriage frame by the bolts *kk*, and connected to the bracket by two links, one of which is seen at *s*,) for keeping the propelling wheel in, always pressing on the road. The propelling wheel is *plane*, and is situated in exactly the same part of the carriage as the one in fig. 1. As the cylinder and bracket will work a little, on account of the inequalities on the road, the parts of the steam and eduction pipes, not shown in the sketch, but connected at *nn*, must have raft joints. The boiler pumps may be wrought off the crank pins, care being taken to have the lines of action in the rods, or the centres in the levers in a line with the axis of the cylinders, so that working the pumps, may not lessen or increase the action of the propelling wheel on the road. The valve gearing is not shown, and the other parts of the engine will be understood by every one at all acquainted with the subject.

I am, Sir, yours, &c.

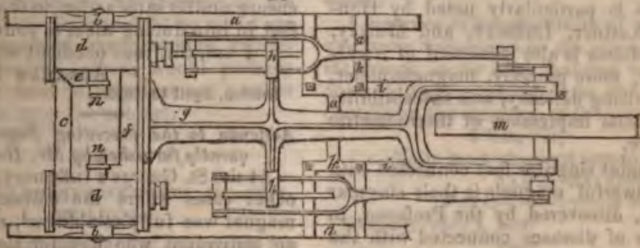
W. WHITELAW.

London, March 20, 1833.

* The intelligent reader, who is aware that the experience of recent years has shown the utter inutility of such appendages, will be startled at their introduction here; but it will be afterwards seen, that the plan which Mr. Whitelaw is here describing is of the date of 1827, and has been since improved into that represented on the opposite page.—ED. M. M.

2.

3.



DR. KEIL'S MEDICAL APPLICATION OF MAGNETISM.

Sir,—There is perhaps no science which, during a comparative short time, has made greater advances, than that which embraces the kindred facts and phenomena of electricity, galvanism, and magnetism. The idenlity of the matter or agency developing the phenomena, included under these different departments of physical science, is now so fully proved, that it were better perhaps to reserve a space for a title for the assemblage of facts, rather than to restrict it, by associating it with any one of these single and peculiar modifications.

If any other fact to prove the identity of these agencies were required, since the development of the interesting experiment of eliciting a spark from a powerful magnet, by separating the bar from contact, so beautifully demonstrated at the Gallery of Practical Science, in Adelaide-street, it is now shown by the remarkable similarity of action of the two, as medicinal agents, afforded in experiments with some very powerful magnets made by Professor Keil, of Jena. At a late meeting of the Royal Society, the Professor was introduced for the purpose of exhibiting these magnets, *as well as explaining some of the most important results* attending their application, as a medicinal agent in the cure of nervous diseases. It is not the first time that magnetism has been applied for this purpose in the hands of empirical pretenders; but whatever mystery might formerly attend its exhibition, it is now satisfactory, that, directed by a gentleman of acknowledged scientific attainments and veracity, their pretensions are based upon claims which appeal to the consideration of the scientific public.

Since his arrival in London, I have visited the Professor, and have had every facility afforded for the most critical examination of his claims to notice. It is evident, from the very superior power possessed by his magnets over all others of equal size, that Dr. Keil is in possession of some mode of accumulating a far greater intensity of magnetic force than had hitherto been discovered. He is possessed of a lyre-shaped magnet, consisting of five bars, and weighing about 5lbs.; and which is capable of sustaining a weight of from 100lbs. to 130lbs., according to the state of the atmosphere, the effects of magnetism as well as electricity, being found to be greatly modified by atmospheric influence. This must be acknowledged, by all who are acquainted with the subject, to be a far greater degree of

intensity than can be communicated by the modes adopted by English philosophers; whilst the Professor informs me that the power is permanent, even without the continuous contact of the bar. This magnet is also possessed of very powerful properties of promoting chemical action, in reddening vegetable blues, producing crystallisation, and reducing mercury from its combination with chlorine in the deuto-chloride of that metal (corrosive sublimate): this property of magnets is particularly noted by Hansteen, Kastner, Ludecke, and Murray. The Professor is also possessed of a galvano, or, more properly, magneto-meter, of surprising delicacy, and susceptibility to the least impression of thermometric influence.

The most singular fact connected with these powerful magnets is their singular efficacy, discovered by the Professor, in the cure of diseases connected with the nervous system, as in neuralgia, cephalalgia, &c., and in alleviating the worst symptoms of tic doloreux, epilepsy, paralysis (unattended with organic defect), rheumatism, gout, spasm, &c. In these complaints the most immediate relief is obtained by the application of the instruments; and, from trials which I saw made at a public infirmary, under the superintendence of the physician, I have seen cases sufficient to convince me that this discovery of a new branch of the healing art must shortly rank as a new era in the history of medicine.

A most decided proof of the influence of these magnets through the course of the nerves, is shown by the diminution of temperature which may be induced by their application, amounting from 5° to 7°; a fact which must be sufficient to convince the most sceptical or prejudiced observer, of the existence of a relative sympathy between the magnetic and the nervous fluids. The application of magnetism to medical purposes is the more interesting, and cannot fail to be more speedily appreciated by the public, as it follows the discovery of the experiment to which I have adverted, as establishing the identity of the matter of magnetism with that of electricity. If this identity is proved, it is certain that this matter must exist in the most condensed form in the magnet; and hence it is easy to comprehend how all *the medicinal results of the administration of electricity, may be* ensured by this application of the magnet, whilst the medical practitioner is possessed of a powerful remedial agent in its most eligible form for exhibition.

Convinced that the medium of your valuable journal is the most powerful vehicle by which the claims of Dr. Keil can secure the patronage of the British public, I trust that they will meet the cordial attention and inquiry of yourself and many scientific correspondents; and which cannot, I am convinced, fail to ensure similar satisfaction, to that which I feel in introducing them to your notice.

I am, Sir, your obedient servant,

ABRAHAM BOOTH.

London, April 10, 1833.

Addenda to the preceding Paper, subsequently furnished by Mr. Booth.

At the St. George's Infirmary, amongst other cases where the efficacy of the magnet was fully established, was one of an individual who had for six months been confined to his bed under the severest form of rheumatic gout, and in which every application had proved wholly ineffectual. After the first application of the magnet, the patient, who had wholly lost the use of his limbs, was enabled to use his arms with perfect freedom; and at the fifth application was so far recovered as to be wholly freed from pain, and capable of walking about with perfect ease, merely suffering from the debility consequent upon his protracted confinement.* In several cases of paralysis, accompanied by organic defect, which last is, of course, wholly out of the reach of magnetic influence, the application was succeeded by total exemption from pain, and, as in the former case, by profuse perspiration. These results can be confirmed by Dr. Clarke, the Physician to the establishment.

Whilst magnetism can thus effectually control diseases formerly considered *opprobrium ars medicinæ*, does it not tend to establish the identity, or, at least, the sympathy of magnetism with the vital principle? Since writing the preceding observations I have had my attention drawn to a letter from Mr. Bywater, of Liverpool, contained in the *Globe* of the 12th inst., in which, founded on a train of analogical deductions, he proceeds to establish the probable identity of the cause of magnetism, electricity, galvan-

* This patient has since left the establishment, perfectly recovered.

ism, heat, light, attraction, and vitality, and that these phenomena are but modifications of one series of emanations. To establish such an identity the train of discovery is now evidently tending, although perhaps our knowledge of the phenomena is at present too limited to enable us adequately to appreciate their generalisation. Mr. Bywater states that he has, by a combination of powerful magnets, succeeded in producing a continuous stream of sparks, similar to those excited by an electrical machine. It appears to me that this combination might be made use of as a powerful instrument of experimental research, which would perhaps materially tend to augment our present knowledge upon the subject.

April 13, 1833.

BALLINGALL'S IMPROVEMENTS IN SHIP-BUILDING.

Sir,—In the Mechanics' Magazine for the 2d of February last, there is a notice of a plan and book published by me on improving the construction of merchant shipping, for which I thank you. There is, however, one mistake in it, which I must take leave to correct. I undoubtedly most cordially approve of the plan and effects of doubling vessels' bottoms and sides, *outside*, as recommended by Mr. Snodgrass. The expense of that method, however, hinders it from being generally adopted, especially as the present classification of merchant shipping in Britain takes away every inducement to lay out any expense which can possibly be avoided, on a vessel which is of, or nearly of, the first class. Now, the last sentence of the last paragraph of the notice, immediately before the quotation from the *Scotsman*, implies that this method has been practised in the Kirkcaldy smacks, Enterprise and Fifeshire. This is not the case, and is the mistake which I think it right to correct. The inside or ceiling planking of these vessels only is made completely water-tight, on the plan described in the "Mercantile Navy Improved;" and the whole expense of fitting each of the smacks, including a'l outlay, was under £30. The effect has been as correctly described in the quotation from the *Scotsman*. This trifling expense, therefore, cannot hinder any shipowner, who wishes to preserve his vessel, and to save insurance on her and cargo, and also to get a preference to his vessel in consequence of additional safety, when seeking a cargo, from adopting it. I may also observe, that there is an erroneous position given to part of the letters of reference in fig. 2, which is apt to produce a misconception of the mode of construction I recommend. In fig. 2, S S are merely supporters to the bilge-piece, and not water-courses; for, by the method proposed, the fabric is solid, and all the water-courses would be inside the vessel.

I embrace this opportunity of sending you some documents on the prevention of shipwreck, in the hope that you will lend your aid to impress the facts which they contain on the attention of the public, and

I am, Sir,
Your most obedient servant,
JAMES BALLINGALL.
Surveyor of Shipping at Kirkcaldy.

Kirkcaldy, April 4, 1833.

The documents alluded to by Mr. Ballingall at the close of his letter derive a peculiar interest at the present moment, from the dreadful losses which have been caused at sea by the awful storms of last month. No less than 59 merchant-ships were reported at Lloyds as having been wrecked in two days, not including (we believe) the Erin steamer, which it is now certain must have sunk, with every soul on board. *Not one King's ship, however, was lost.* Now, it is probable that had these merchant-vessels been built on the plan of filling in the timbers which Sir Robert Seppings introduced into the Royal Navy, and Mr. Ballingall is now exerting himself so strenuously and patriotically to introduce, along with other improvements, into the merchant service, there is reason to believe that the greater part of them might have been saved. A correspondent of the last Number of the *United Service Journal*, in describing the gale of the 20th of March, says:—"It came on by a sudden shift of wind at about 3 A. M., and instantly blew a furious hurricane, driving on shore and upsetting coasting-vessels, dismasting large ships, unroofing houses, tearing up mighty oaks, whirling the waves like a boiling cauldron, and spreading ravage in all directions. A noble East Indiaman, and some other vessels, *were shivered to splinters* upon the rocky coast near Fishguard and Ramsey Sound; every

soul perished!" But who can wonder that they should be "shivered to splinters," when probably not one of them had a casing of more than 3 inches thick, and some only 1½ inch; while a man-of-war has a solid bottom of 15 inches thick? Is it stupidity, economy, villainy, or what, that causes this wanton exposure of life and property? Perhaps the following extract from one of the papers which Mr. Ballingall has handed to us may serve to furnish an explanation. It is part of a Report made by a Committee of Merchants, Shipowners, and Underwriters, on the Classification of Ships, presented to a General Meeting, held at the City of London Tavern, as far back as the 1st of June, 1826, and conceived in the following terms:—

"And can it then be contended, in the very face of conclusive evidence, proving that property *and life* are continually sacrificed to the negligence and cupidity of those who, from ignorance or hope of fraudulent gain, construct insufficient ships, or neglect to maintain them in a state of secure efficiency, that the public is entitled to no protection, lest control should interfere with the rights of property, or that *that can be private right which directly produces public wrong?*

"Your Committee are persuaded it is unnecessary to enlarge on this topic, and that, whatever may be the opinion entertained with respect to the specific propositions submitted by them, the necessity for *some* provision against the dangers arising from ignorance, negligence, and fraud will be generally admitted."

To this extract there is appended the following note (by Mr. Ballingall, we presume):—

"*No measures are yet in practice to remedy this crying evil,* and property *and life* are every day sacrificed to the negligence and cupidity of those who, from ignorance or hope of fraudulent gain, construct insufficient ships, or neglect to maintain them in a state of secure efficiency; and unless the public send forth its irresistible voice, there is every reason to apprehend that the practice of building insufficient ships, or maintaining them in a state of secure efficiency, will never be remedied, and *public wrong* will continue to be perpetrated, arising from ignorance, negligence, and fraud, and terminating in the most melancholy and fatal results to property *and LIFE.*"

The sum of the matter seems to be briefly this:—shipbuilders and insurance-*brokers thrive upon ship*wrecks; and, therefore, all other interests must be sacrificed to theirs! Talk of the savage wreckers on some parts of our coasts: the men who purposely make ships and encourage the making of ships, so that they may be wrecked *with every possible facility*, are ten times more savage, more inhuman, more diabolical.

Since we took notice of Mr. Ballingall's scheme for the reform of this disgraceful state of things, it has been under the consideration of the Society of Arts for Scotland; and we are glad to perceive that they have pronounced an opinion of its merits entirely in conformity with our own. On the 6th of February last, a Report from a Committee appointed to investigate the subject, was "read and approved of by the Society," in which the Committee state, that "after an attentive examination of his plans, and after a personal inspection, by some of their number, of a vessel, in the construction of which his principles had been applied, they are unanimously of opinion that the general adoption of the system recommended by Mr. Ballingall would be of the greatest service to the country; as, although the expense of the construction of vessels would, in some degree, be increased, yet their greater durability, and the security of their cargoes against partial damage, would more than compensate the additional outlay." Among the names subscribed to this Report are those of Admiral Sir David Milne, one of the most experienced officers of the Navy; and John Robison, Esq., the able and intelligent Secretary of the Royal Society of Scotland.

PRESERVING FRUIT WITHOUT SUGAR.

Sir,—In the year 1808 (twenty-five years ago) I received a premium from the Society of Arts for a method of preserving fruit without sugar, the particulars of which was published in the twenty-sixth volume of their Transactions; but as their publications seldom extend beyond the subscribing members, I have made some extracts from the method laid down, for the purpose of a more extended public benefit, by submitting them to the readers of your magazine.

From the experience I have had in bottling fruits in the manner laid down, I have no doubt but they will keep perfectly good for many centuries, as the

Society have in their museum some of the samples of fruit twenty-six years old, and I have some gooseberries by me twenty-five years old, and which appear to be as perfect and good as they were before they were bottled.

THOMAS SADDINGTON.

Process for Preserving Fruit.

The bottles I chiefly use for small fruit' such as gooseberries, currants, cherries, and raspberries, are selected from the widest necked of those used for wine or porter. Having got them properly cleaned, and the fruit ready picked (which should not be too ripe), fill such of them as you intend doing at one time as full as they will hold, so as to admit the cork going in, frequently shaking the fruit down whilst filling; when done, fit the corks to each bottle, and stick them lightly in, so as to be easily taken out when the fruit is sufficiently scalded, which may be done either in a copper or large kettle, over the fire, first putting a coarse cloth of any sort at the bottom to prevent the heat of the fire from cracking the bottles: then fill the copper or kettle with cold water sufficiently high for the bottles to be nearly up to the top of the neck in it; put them in sideways to expel the air contained in the cavity under the bottom of the bottle; then light the fire, if the copper is used, taking care that the bottles do not touch the bottom or sides, which will endanger their bursting, and increase the heat gradually until it comes to about one hundred and sixty, or one hundred and seventy degrees, by a brewing thermometer, which generally requires about three quarters of an hour. For want of such an instrument it may be very well managed by judging of the degree of heat by the finger, which may be known by the water feeling very hot, but not so as to scald it. When it arrives at a sufficient degree of heat, it must be kept at the same for about half an hour longer, which will at all times be quite enough. During the time the bottles are increasing in heat, a tea-kettle full of water must be got ready to boil; as soon as the fruit is properly scalded, take the bottles out of the water one at a time, and fill them within an inch of the cork, with the boiling water out of the tea-kettle. Cork them down immediately, doing it gently, but very tight, by squeezing the cork in; tie the cork down, and lay the bottles on their side, as by that means the cork keeps swelled, always observing to let them lie on their side until wanted for use. During the first month or two after they are bottled, it will be necessary to turn the bottles a little round once or twice in a week, to prevent the fermentation that will arise on some fruits from forming into a crust, by which proper attention the fruit will be kept moist with the water, and no mould will take place. It will also be proper to turn the bottles a little round, occasionally afterwards. This manner of preserving fruit will be found particularly useful on shipboard for sea stores, as the fruit is not likely to be injured by the motion of the ship, when the bottles are laid down on their sides, and the corks kept moist by the liquor, but on the contrary will keep well, even in hot climates.

She following sorts of fruit, as samples, were sent for examination, and approved of by the Society of Arts; viz. apricots, rhubarb (peeled and cut into square pieces), gooseberries, currants, raspberries, cherries, plums, orleans-plums, egg-plums, damsons, Siberian crabs, and green gages.

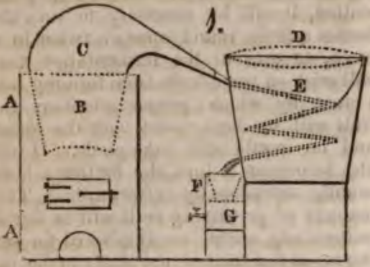
COATING LEAD PIPES WITH TIN.

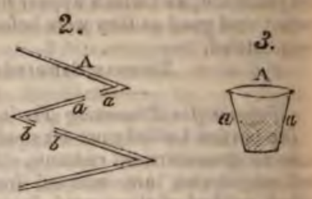
Dear Sir, — Observing in a late number of your valuable Journal, a description of the process invented by Mr. Thomas Ewbank, of the city of New York, U. S., *for coating lead pipes with tin*, for which that gentleman obtained an American patent, in the month of May, 1832, I think it is essential that your readers should be informed that an exclusive right to that invention in this country appertains to Mr. John Warner, jun., brass-founder, lead-pipe manufacturer, &c., of Jewin-street Crescent, London, whose patent passed the great seal on the 24th January, 1833, as correctly given by you in your list of the "new patents granted." Having been the agent employed by Mr. Ewbank in transacting the business in the autumn of last year with Mr. Warner, who is in possession of the communications from Mr. Ewbank in his own hand writing, and having been the patent agent employed by Mr. Warner in procuring his English patent, there can be no doubt of my being correctly informed of all the facts of the case, and I shall feel greatly obliged by your giving publicity to them.

L. HEBERT.

20, Paternoster-row, April 13, 1833.

DISTILLATION OF SALT WATER.





Sir,—It occurred to me some considerable time back, that sea water might be freshened by subjecting it to a process similar to that described by E. W. B. in a recent number of your valuable Magazine, and so struck was I with the importance and feasibility of the plan, that I resolved upon making it public as soon as possible. The following passages, however, occurring in Dr. Rees's Cyclopædia, art. WATER, which I referred to for information, prevented me from so doing:—

" The method of obtaining fresh water from the *distillation of sea water*, was practised by Sir R. Hawkins in the reign of Queen Elizabeth," &c.

" Experiments were afterwards made by Hales, Lister, Hanton, Lind, and others, to simplify and render more perfect the process of distillation; and at length it attained a great degree of perfection, both in France and England. Thus M. de Bougainville, in his " Voyage round the World," bore ample testimony to the utility of the machine for *distilling sea water*, which had been made public in 1763 by M. Poissonnier, its inventor; and Lord Mulgrave, in his " Voyage to the North Pole," in 1773, did equal justice to the method of obtaining *fresh water from the sea by distillation*, which had been introduced into the English Navy in 1770, by Dr. Irving, and for which he received a parliamentary reward of £5000."

From the above extracts it is clear that the idea suggested by E. W. B. was known and adopted many years ago; and, consequently, that his plan presents no *novel* feature of importance, unless, indeed, the apparatus which he has invented for putting that "idea" into execution, is superior to those already in existence. Without attempting to settle this point, I would respectfully call attention to the accompanying sketch of an apparatus, which would, I think, prove equally effective, and be at the same time cheaper and more compact than his.

Fig. 1, A A represents a common furnace; B, the boiler; C, a still head, accurately fitted to the boiler at the joint *a a;* D, the condenser, filled with cold water; E, the steam-pipe; F, the filter; and G, the reservoir.

Fig. 2, A represents the steam-pipe, taken to pieces for convenience in cleansing, or packing away when not required. The joints *a a*, *b b*, must be made to fit closely.

Fig 3, A, represents the filter, the bottom of which is perforated with numerous small holes, and covered up to *a a* with coarsely powdered charcoal, which, by exerting a *chemical* influence upon the water, deprives it of any septic properties, which, from the putrid animal and vegetable substances it holds in solution, it may be supposed to possess.

The mode of using the apparatus is sufficiently plain. When not required, the condenser can be emptied and converted into a barrel, or be made the receptacle for the still-head and steam-pipe.

I remain, Sir, yours, &c.

G. E. EACHUS.

April 11, 1833.

ON THE UNDULATING RAILWAY.

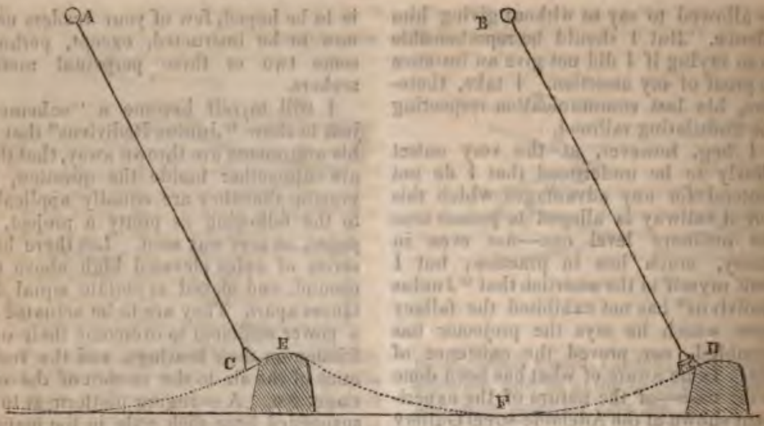
Sir,—Your correspondent, " Junius Redivivus," is a clever writer but an unpractised thinker. He was evidently not brought up a lawyer, to examine both sides of a question. He will do better in time, but at present he is apt to take a single view of things, and therefore an incomplete and superficial one, if I may

be allowed to say so without giving him offence. But I should be reprehensible in so saying if I did not give an instance in proof of my assertion. I take, therefore, his last communication respecting the undulating railroad.

I beg, however, at the very outset clearly to be understood that I do not contend for any advantages which this sort of railway is alleged to possess over the ordinary level one—not even in theory, much less in practice; but I limit myself to the assertion that "Junius Redivivus" has not exhibited the fallacy upon which he says the projector has stumbled, nor proved the existence of one. Is he aware of what has been done in the case—of the nature of the experiment shown at the Adelaide-street Gallery of Practical Science and Works of Art? A carriage, whose moving power was a spring, was wound up to the same tension in each trial, by traversing it backwards a given distance on the floor. If placed alternately on the level and on the undulating railway, it was found that it travelled a certain distance in the same time, although the extremity of the latter railway was raised six inches above the level of the former. Now where is the fallacy of which "Junius Redivivus" speaks. Is it in the *fact?* and would he say with an engineer, a friend of mine, that though he should see it he would not believe in it? All his arguments, indeed, go to prove that the thing is impossible; but on further consideration he may be inclined to suspect their relevancy to the subject he has taken in hand, rather than the accuracy of his sight. It may, however, be said that the fallacy lies in the inference drawn from these experiments as to the superior advantages of this new form of railway. It is admitted—but then why did not "Junius Redivivus" apply himself to this point, detect the lurking error, and show that the experimental trials were not fairly instituted? Instead of this, he contents himself with general reasoning about the impossibility of power being self-generated, maintaining that "what is gained by an accelerated motion down hill, is balanced by an up hill to ascend in turn;" that "no more power can come out of a thing than that we put into it;" and with giving superfluous utterance to many more such truisms, about which, it is to be hoped, few of your readers need now to be instructed, except, perhaps, some two or three perpetual motion seekers.

I will myself become a "schemer," just to show "Junius Redivivus" that all his arguments are thrown away, that they are altogether beside the question, by proving that they are equally applicable to the following as pretty a project, *on paper*, as ever was seen. Let there be a series of axles elevated high above the ground, and placed at certain equal distances apart. They are to be actuated by a power sufficient to overcome their own friction on their bearings, and the resistance of the air to the motion of the carriage, &c. A swinging platform is to be suspended from each axle in the manner of a pendulum, and, at the extremities of the arcs which they describe, short roads are to be constructed in order to receive the carriage in its transit from one platform to the other. A slight sketch will explain my meaning better. (See other side.)

A B, are axles; C D, platforms; F D, roads. On the arrival of the platform at E, the carriage, being on wheels, will by its momentum be carried over the road to the platform at C, and again be launched forward to its next stage, and so on in succession. Will "Junius Redivivus" be so good as to point out any theoretic absurdity in this notable scheme, however preposterous it may be in a practical point of view. Unlike the undulating railway, its economy of power is acquivocable and undeniable, and yet it is equally open to all "Junius Redivivus's" up-and-down-hill arguments, and which are in an equal degree irrelevant. If I were to say that the momentum of the platform and its carriage, acquired in the descent from D to F, was more than sufficient to carry it from F to E, I should be chargeable with the nonsense against which his arguments are directed; for "the man should indeed be laughed at who asserts that the power of a machine is multiplied by going up and down hill." Nothing, however, of the kind is asserted, not even, as I understand, by the sanguine projector of the undulating railway, much less by its scientific friends; but it is contended, and, in reference to the scheme before your readers, with the full assurance of truth, that friction is diminished, and power therefore saved, but not



multiplied, as "Junius Redivivus" would have it. That there is less friction in this pendulum mode of conveyance than on a common railway, is evident from the circumstance of its being confined to a trifling motion of the axles in their bearings during the passage of the load through the much greater space of the arc, D E. Not that the diminution of the friction would be exactly in this proportion, for the wheels of the railroad carriage would have to be taken into the account. The case assimilates to that of a large wheel and a small one, and the saving would be in the proportion of the ratio of the pendulum rod and the radius of its axle to the ratio of the carriage wheel and its axle. The advantage here spoken of is unquestionable; but whether there would be less friction on an undulating than on a level railway, is a debateable point, and "Junius Redivivus" should have combated the affirmative instead of fighting a man of straw. He should have shown that friction would not be diminished at any part of the curve, or, admitting a diminution at any place or places, he should have instructed us how it would be compensated by an excess of friction. I need not say where or how—that is for "Junius Redivivus" to do. The writer in the *Athenæum* is certainly wrong—not so much from taking an incorrect as an incomplete view of the subject. He has omitted all consideration of the centrifugal force that is generated, and which much influences the result. It may here be asked, how then did the experiments exhibit results apparently so much in favour of the undulating railway? I cannot enter upon this point, as I have not investigated or even seen them; but there is no doubt that it arose principally, if not wholly, from the inertia of the carriage having been overcome by an extraneous force in the one case and not in the other. The projectors doubtless considered the experiment to be a fair one, but I hope they will not allow themselves to be self-deceived to their own bitter cost.

There is a sort of paradox connected with the subject, which it may be worth while to mention here, especially as I am inclined to think it is at the foundation of those fallacious views which the projectors and supporters of this scheme entertain. Among the latter are some whose eminence and position in the scientific world should have kept them from drawing crude and hasty conclusions. I have said that the axles B A, &c., are to be actuated by a power sufficient to overcome their own friction, the resistance of the air, and that opposed to the passing of the carriage over the roads D E, &c. Now, without further application of power, no progress can be made; but yet without any continual supply of it, as locomotion proceeds, and simply by a single additional effort in the first instance, effected by the descent of the machine from D to F, not only will the distance D E be accomplished, but another and another, even unto the world's end. That is to say, the initial force, though only just competent to produce motion of a given velocity, is effective for its pro-

longation at the same rate to any distance, or for any length of time. And this is true, not only of the present scheme, but also of the undulating railway. Oh! it is absurd, says "Junius Redivivus," and begins immediately to smell perpetual motion. He must remember that, by the terms of the proposition, all hindrance is provided against; the motion, therefore, is unimpeded, and no reason can be assigned why it should cease after it is once commenced. The paradox is only in the way of putting the case, for the like may be said of all machinery and moving bodies. It is probable, however, that some confused notions on this head may have led the projectors of the undulating railway to imagine that they had herein an exclusive advantage over the level railway, and that the succession of descents maintains the moving force which is first generated, forgetting that such force needs no supply for its maintenance, and that all that is requisite for its unimpaired existence, is to provide that it shall not be exhausted by demands upon it to meet friction, &c. The same thing takes place on the ordinary railway, though not precisely in the same manner. At first the impelling power of the engine is greatly in excess above the resistance, and constitutes an accelerating moving force up to the point at which it is no longer in excess, or when a uniform motion is obtained. The steam power is now wholly employed in overcoming resistance, and *not* in producing motion, otherwise an accelerated velocity would take place. The motion, therefore, results from the force imparted to, and residing in, the machine, and will continue unchecked for any time or distance if that force is not drawn upon for any other purpose. If it were an object of any moment to shorten the time in imparting to a carriage the inertia of motion, this may be obtained by a commencing inclined plane on a level railway, as well as on an undulating railway; but that any after advantage can be procured by a succession of them is wholly a mistake.

In connexion with this subject and the before-mentioned place of exhibition, I beg, in conclusion, to draw attention to Mr. Saxton's very ingenious and original mode of propelling a carriage on a railway. It is a reversal in practice of the principle embodied in the windlass of unequal diameters.

I am, Sir, yours, &c.

BENJAMIN CHEVERTON.

P.S. Verily, our coachmakers are wofully ignorant of "the application of the principles of science;" they have not gone deep in their studies, or "Junius Redivivus" would not have been obliged to tell them that a plate of iron was stiffer placed on its edge than when laid flat. His scientific expedient of accommodating the tension of carriage springs to their load, "by supplying the absence of flesh and blood by weights conveniently arranged, just as a ship takes ballast on board when her cargo is discharged," reminds me of a mode of travelling which I noticed in Spain. Two persons being mounted on a mule, one on each side, the lighter pannier was balanced against the other with a load of stones. When "Junius Redivivus" wrote this remark, "that no more power can come out of a thing than is put into it," did it not remind him of his own proposal to employ a steam-engine to work an air-pump, for the purpose of having air-guns instead of steam artillery? Surely he too is not "one of those numerous unthinking people who believe that, by making a simple machine complicated, they actually multiply their power," or who imagine that they cannot procure a thing so well at first as they can at second-hand.

These observations, as they are made in good part, so I hope they will be taken. They allude to mere specks, as it were, on the face of the sun, but which are blemishes notwithstanding.

MR. GODSON'S BILL FOR THE IMPROVEMENT OF THE PATENT LAWS.—WITH REMARKS.

(Concluded from last No., p. 29.)

Inventions to be Specified by Models as well as Drawings.

"And whereas there is often great difficulty in giving a full description of an invention, by which it can be readily performed or made either by a written account or drawing thereof; be it further enacted, that it shall be lawful for the patentee, in addition to his written description, to deposit a model or pattern of his invention in some public building, to be named by the Attorney-General in his report or bill, and that the said model or pattere may be produced or given in evi-

dence by any person whatever in any court of law or equity."

Alteration in the Practice of Obtaining Patents.

"And whereas the present mode of obtaining letters patent is most irksome and injurious to inventors; and whereas the sign manual of his Majesty may be without detriment to the public service dispensed with, as to the warrant and bill of letters patent in England; be it further enacted, that letters patent for inventions may be granted for England, under the Great Seal, in the manner following (that is to say), that the said inventor or inventors may be permitted to present a petition addressed to his most gracious Majesty, setting forth and declaring that he is the first or true inventor of some new invention, naming it, and also declaring whether it be his intention or not to take out letters patent either in Scotland or Ireland; but that he shall not be required or called upon to make an oath in support of the said petition. And be it further enacted, that the said inventor shall make a short description of his invention, to be called a 'preparatory specification,' which shall contain an outline or sketch of his said invention; and that he shall deliver the said preparatory specification, sealed up with the said petition, at the office of the Secretary of State for the Home Department, and thereupon paying the fees hereinafter required. And be it further enacted, that the said petition and the said preparatory specification, so sealed up as aforesaid, shall be referred by the said Secretary of State to his Majesty's Attorney or Solicitor-General, who shall report thereupon and make out a bill, as heretofore, for the purpose of the said bill being carried to the Office of Patents, for the purpose of letters patent being made out and receiving the Great Seal of England: provided always, that it shall not be necessary to take the bill to the offices of the Signet, Privy Seal, or Hanaper. And be it further enacted, that the Lord High Chancellor, or the Keeper of the Great Seal, may and is hereby required to affix the Great Seal to letters patent for inventions, upon the authority of the said bill and report of his Majesty's Attorney or Solicitor-General; and that the letters patent shall bear date from the day of presenting the petition at the office of the Secretary of State for the Home Department, or the day of the date of the report of the Attorney or Solicitor-General, if he may so report.

"And whereas great abuses have sprung up from the manner in which persons enter caveats in the Court of Chancery and at the offices of the Attorney or Solicitor-General, and many inventors have been injured by the secret of their inventions transpiring before the letters patent were sealed; be it enacted, that caveats shall not be entered at those offices, except at the office of the Attorney-General, during the fifteen days from the day of the title to a patent appearing in the *Gazette;* and each person or party entering a caveat shall, at the time of entering the same, lodge in the office of the Attorney-General an outline or description of his own invention, which he imagines or thinks is about to be made the subject of letters patent to be granted to another person, to be called 'the preparatory specification.'

"And whereas it is necessary for the detection of frauds and the prevention of improper letters patent, and also for the determination of the priority to be given to letters patent, that his Majesty's Attorney or Solicitor-General should have the assistance of men practically versed in arts and sciences; be it further enacted, that if any caveat be entered or objection raised to the grant of any letters patent within fifteen days from the publication in the *Gazette* as aforesaid, then the Attorney or Solicitor-General shall require the parties objecting to lay a statement, in writing, of their objections before him the Attorney or Solicitor-General, who may thereupon call to his assistance any two men practically skilled in the arts and sciences, to assist him in coming to a determination whether such letters patent ought to be granted, or to whom they should be granted. And be it further enacted, that the said Attorney-General or Solicitor-General may direct any and what costs they think fit and proper to be paid to the said examiners, or by or to whom each party respectively; and that the said Attorney-General or Solicitor-General may direct, in his report, whether the letters patent to be granted shall bear date from the day of the petition, as aforesaid, or from the date of his report."

There are a great many things besides the "sign manual of his Majesty" which might, we think, be dispensed with, "without detriment to the public service." We are at a loss to perceive how the "public service" is benefited at all by the present circuitous and dilatory mode of proceeding, and do not think that matters would be mended much by the alterations here proposed. We look upon nine-tenths of the forms and ceremonies which a patentee is now com-

pelled to go through, as existing solely for the benefit of the officers of the Crown, who derive a revenue from them, and of those who make a business of acting as agents for the solicitation of patents. The patentee is made to run the gauntlet of so many of his Majesty's servants, simply in order that each may have a pretext for fleecing him in his turn. The practice is a remnant of the old vail system, when a person could not have audience of any great man without feeing a whole host of retainers—one for opening the outer door, another the inner, a third for taking care of his hat, a fourth of his gloves, a fifth of his cane, and so on. All that the "public service" really requires in the matter of patents is that there should be a good and sufficient specification; and every thing that is not essentially conducive to that end ought at once to be swept away. Among the forms which Mr. Godson proposes to preserve are the petition to the King; the reference of that petition to his Majesty's law-officers; the report thereupon; the preparation of a bill in conformity with that report; the making out of letters patent in conformity with the bill; and, finally, the affixing of the Great Seal. But of what real use is any one of all these things? None of them forward the matter of the specification in the least; and the whole of them together do not confer any right which might not be conferred equally well by simply declaring that when a person specifies an invention in some public registry appointed for the purpose, he shall *ipso facto* have all the right to it, for fourteen years thereafter, which letters patent could heretofore have given him. Why should letters patent be necessary to the inventor of a machine, and not to the author of a book? Why should not a simple "entry" have as much virtue in the one case as in the other? We shall perhaps be told that it is not always an inventor is ready to specify. To this we make answer, that neither is an author always ready to furnish copy to the printer, and that until an inventor is ready to specify he has no business with a patent. The title and general conception of a book are often the best things about it; but who ever yet thought of securing the copy-right of a book before the book itself was ready? And why should such a practice be *less absurd in the case of patents than of books? The evils which have resulted from the time given for the* specification of patents are numerous and unquestionable. Patents are taken out for the most crude and impracticable things imaginable, simply in consequence of the parties not taking time to follow out their first rough conceptions through all their practical bearings. Others, again, are obtained for schemes which are as yet but half formed, in the expectation that, by the time the specifications become due, all will be made complete. Nay, patents are not unfrequently taken out for inventions which have no existence, beyond a mere name, even in imagination. A person of a clever and speculating turn hears that there is a something much wanted in some particular branch of business, and forthwith asserts that he has discovered the very thing, in the confidence that, during the time given him to specify, he will be able, with the help of the information to be gleaned from the many curious inquirers whom the announcement will bring about him, to invent it in reality; for there is much truth in a remark made by one of the witnesses before the late Committee of Inquiry on the Patent Laws, (we think it was Mr. Hawkins, but, not having the evidence at hand, we cannot speak with certainty,) that the difficulty with intelligent mechanics is not so much to invent things as to know what things may best be invented. The consequence of all this is, that of the inventions for which patents are taken out, many are never specified at all, the parties getting wiser as they search and try farther; many are specified for mere credit's sake, when all hope of their turning out to be worth any thing has vanished; and by far the greater number—not certainly fewer than one in ten—prove wholly abortive. Nor is this all; for though the giving of time to specify is intended solely as a favour to inventors, it sometimes happens that inventors are themselves very serious sufferers by it. An invention will sometimes be so simple, that you have but to name it to give to numbers of ingenious and well-informed men a complete insight into its nature. One will say, "Oh, I see what that must be; but how strange that it should never have been thought of before!" Another, less honest and candid, will exclaim, "The very thing I have often thought of myself;" and forthwith he goes and enters a caveat against the patent, when all that remains to frighten the luckless applicant into

going snacks is a bold face (seldom wanting where there is a bad heart beneath) and some small share of address. The chances of robbery from this cause are so notorious, that it is become a fixed rule with the persons who practise as patent agents, to make the titles of patents as little expressive as possible of the nature of the thing patented; but then patent agents are not always consulted in these cases, and, truth to speak, are not all of them worth consulting—even the best of them cannot always be obscure enough—and inventors do occasionally act for themselves without thought of concealment or evasion. For what good purpose, then, is this practice of allowing a time to specify kept up?

We could mention many other equally forcible reasons for its abolition, but we see no occasion for farther enlargement till we are put in possession of at least one feasible apology for it? We shall only at present add, that were the new plan of "preparatory specifications" proposed by Mr. Godson adopted, it would manifestly make matters only worse and worse. There should be but one specification; and every other step in the present practice of taking out patents—saving only so much of what relates to the enrolling of specifications as is worth preserving—ought to be abolished.

Expense of Patents to be Reduced.

"And whereas it is expedient that the costs and expenses of obtaining letters patent for inventions in England should be lessened: be it enacted, that the fees payable at the offices of the Secretary of State, the Attorney-General or Solicitor-General, the Signet Office, the Privy Seal Office, and the Great Seal Office, shall and the same is hereby reduced to of the amount heretofore by custom paid when the letters patent are granted for the term of fourteen years, and that the said expenses shall be reduced, and the same are hereby reduced to of the amount heretofore by custom paid, when the letters patent are granted for the term of seven years. And be it further enacted, that the fees payable at the offices of the Secretary of State, Signet, and Privy Seal, shall be paid to some person authorised to receive the same at the office of the Secretary of State at the time the inventor leaves his petition there, and that the fees payable at the Hanaper shall be paid to a *person authorised to receive* the same at *the office of the Great Seal.*"

We hail with pleasure the prospect of any reduction, however small, being made in the present enormous charges for patents; but shall never think either the justice or expediency of the case satisfied until they are reduced to what will suffice to pay, on the most moderate scale possible, for the trouble attending the enrolment of the specification. We defy any person to show us a single good reason why a person should be able to secure a monopoly of a book for twenty-eight years for half-a-crown, and be compelled to pay *three thousand times* that sum for a monopoly of a mechanical invention (which is but another effort of mind) for half the period. The difference is quite monstrous. The same considerations which caused the field of literature to be thrown open, apply with undiminished force to throwing open the field of mechanical invention. The system of licensing books which prevailed in the days of the Star Chamber was abolished because it was destructive of all literary enterprise and freedom of thought; the law of patents is but a similar system of licensing, applied to a class of works of genius which it is nearly of equal importance to the State to foster and protect.

Scotch and Irish Patents.

"And whereas the costs and expenses of obtaining letters patent are unnecessarily increased when taken out for Scotland and Ireland by the patentee of an invention for England; be it further enacted, that an inventor who has obtained letters patent for England may have certificates of the grant of the same, which shall be lodged with the Attorney-General or Solicitor-General for Ireland, or the Lord Advocate for Scotland, and be advertised in the *Edinburgh* or *Dublin Gazette;* and if no caveats are entered or opposition made, then the said Attorney-General or Solicitor-General for Ireland, or the Lord Advocate for Scotland, may at the end of fifteen days from the day of the advertisement in the *Gazette*, report the same, and make out the bill in the usual manner for the grant of letters patent in Scotland or Ireland, but the sign manual of his Majesty is hereby dispensed with as far as it has been required in the granting such letters patent for Scotland or Ireland. And whereas persons living in Scotland or Ireland may be desirous of obtaining letters patent for Scotland or Ireland, without taking out letters patent for England, or at least before they take out letters patent for England: be it enacted, that the sign manual of his Majesty the King shall not be necessary to warrant

the proper officer to fix the proper seal to such letters patent, but the same may be affixed upon the report of the Attorney or Solicitor-General for Ireland, or the Lord Advocate for Scotland. And be it further enacted, that when a person in Ireland has obtained letters patent in Ireland, or a person in Scotland has obtained letters patent in Scotland, he may obtain a certificate thereof."

Why should not one patent taken out in London serve for all the three kingdoms? For no other reason evidently than that three different sets of officers may be feed for the same thing. That so scandalous an imposition should be proposed at this time of day to be perpetuated is astonishing.

Assignment of Patents.

"And whereas the property in letters patent is unnecessarily abridged, without any corresponding advantage to the public; be it enacted, that the person or persons to whom letters patent may have been granted, shall be at liberty to assign or transfer his or their interest in letters patent, or grant licences to make or use the same in any manner or to any number of persons he or they may think best for his or their own advantage."

Extension of the Duration of Patents.

"And whereas it sometimes happens that patentees do not derive an adequate profit from their inventions during the fourteen years for which the letters patent have been granted: and whereas there is no remedy but by act of Parliament, to enlarge the term for which they were granted; be it enacted, that at any time before that term is expired, the patentee or his assigns may obtain by petition a patent to extend the term, and his Majesty is hereby authorised and empowered to grant letters patent of extension, in the same manner as other letters patent for inventions are to be granted; but the Attorney-General shall, with the assistance of the examiners aforesaid, report upon the fitness thereof, and the terms upon which they ought to be granted, and all costs and expenses of making the necessary report shall be paid and discharged by the persons obtaining the said letters patent for an extension of the term."

The propriety of transferring to some minor authority the power which now belongs to Parliament alone of enlarging the term of patents in particular cases, will probably not be disputed by any one. Whether the authority which Mr. Godson proposes to substitute is the best that can be devised is another question. We think it one of *the very worst. The enlargement of the term of a patent* is by far too important a matter to be left to the judgment of the Attorney-General or any other single officer of the Crown whatever. Mr. Godson provides that "he *may* call to his assistance any two men practically skilled in the arts and sciences;" but it is not said that he *shall* do so, or that he shall be bound to act as they may advise. How would it answer to refer the matter altogether to the decision of a jury of twelve such men—giving to the Attorney-General a casting vote in case of equality? We are not perfectly satisfied that this would do, but we throw out the suggestion for consideration.

Legal Proceedings in Support of Patents.

"And whereas great delay, inconvenience, and expense have arisen in consequence of a patentee being often obliged to sue in a court of equity, whilst he has a suit depending in a court of common law; be it enacted, that the plaintiff to a suit in a common law court may, by motion in that court, or from a judge thereof, obtain an order to stay the defendant from making or using the invention, unless an account be kept of the sale or use thereof, and also may obtain an order to inspect the thing supposed to be a piracy of the invention. And be it further enacted, that the defendant may plead the general issue, with which he is hereby bound to deliver a notice of all the objections and defences upon which he intends to rely at the trial of that issue. And be it further enacted, that the venue in any action may be changed, on motion to the court, from the county of Middlesex to the county in which the witnesses reside. And be it further enacted, that either party may obtain an order of the court that the sheriff do return, amongst the special jurors to serve on the trial, twelve men practically skilled in the arts and sciences, and that each party shall be at liberty to challenge six of them; and either party may obtain an order that the said jurors may examine the drawings and models at least two days before the day of the trial. And be it further enacted, that every defendant against whom a verdict shall pass for the infringement of a patent, shall pay three times the amount of the damages suffered by the patentee, as it may appear by the proofs of the patentee or by the account rendered as aforesaid by the infringer. And be it further enacted, that costs to be paid by either party to the other party shall include the costs of scientific witnesses, and also the costs of making experiments."

Some very desirable improvements in the practice of the Courts are, we believe, here proposed to be introduced; but we

are not lawyers enough to speak with certainty.

Proceedings to Cancel a Patent.

"And whereas actions at law may be brought upon letters patent after the patentee has been unsuccessful in one action, and has had a verdict recorded against him; and whereas the present mode of cancelling letters patent for inventions by 'scire facias' is dilatory and expensive; be it enacted, that if the defendant in an action on letters patent obtain a verdict, which is not set aside by the court in which the action be depending, then the defendant shall be at liberty to apply to the said court for a certificate that the said letters patent ought to be cancelled, and the said court is hereby empowered, on motion to be then made, if they think fit so to do, to grant a certificate that the same ought to be cancelled, and the said defendant may take the said certificate to the Lord Chancellor, to whom it shall be a sufficient authority that the said letters patent be by him cancelled."

Limitation of right to challenge Patents.

"And be it further enacted, that if the patentee obtain a verdict, the court may in like manner, at its discretion, grant a certificate that the validity of the letters patent has been fully tried on the merits thereof, that in all future actions brought upon those letters patent the patentee shall, upon production of the said last mentioned certificate, be required only to prove the infringement by the party sued, and the damages suffered, and nothing more."

We have great doubts of the expediency of this clause. What is there to prevent a collusive action from being brought for the very purpose of obtaining a judgment that may protect a very worthless patent from challenge? Mr. Godson will perceive that this is a danger that must be provided against.

Operation of the Act.

"And be it further enacted, that this act shall come into force and take effect, as the mode of obtaining letters patent, from first day of November, in the year of our Lord one thousand eight hundred and thirty-three; and that all the provisions therein contained, shall as far as they can apply to all letters patent then in force, as well as to all letters patent then and thereafter to be granted.

"And be it further enacted, that this act shall extend to Scotland and Ireland."

Having now examined the provisions of this bill in detail, we must observe generally of it that it has been drawn up *in an excessively careless* and slovenly *manner. Mr. Godson* has not made a passable bill of it, even according to his own narrow notions of the rights of inventors and the interests of the public. The clauses do not correspond, as they ought, in their phraseology, and are nearly all disfigured by very gross clerical errors; while regulations are alluded to as having been made, (the advertising in the *Gazette*, for instance,) when there is nothing of the kind to be met with. Altogether the Bill is so faulty a thing, both as to the spirit in which it is conceived, and as to the manner in which it has been framed, that we can entertain no hope of its being moulded into a shape fit for the adoption of the Legislature. Mr. Godson has evidently undertaken a task for which he is unequal; and perhaps the sooner he abandons it the better.

Isometrical Perspective.—Sir, Having read in the Mechanics' Magazine of the 31st ult. a very interesting letter from Mr. Jopling, on the subject of isometrical perspective, together with your explanatory observations thereon, I referred, for farther information on the subject, to the source mentioned in Mr. Jopling's letter, namely, Professor Farish's paper on isometrical perspective, published in Dr. Gregory's "Mathematics for Practical Men;" but, from not having, I presume, as yet attained a sufficient knowledge of perspective, I could not well understand the instructions given by Professor Farish. I therefore take the liberty of addressing you on the subject, to request through you, Sir, that Mr. Jopling would have the kindness to favour the readers of the Mechanics' Magazine with some farther instructions on this useful and interesting subject; and should he be so good as to comply with this request, that he would, in doing so, give an example, showing, from the commencement to the completion, the method of drawing any object—a bridge for example—in isometrical perspective.—I am, Sir, your most obedient servant, A Constant Reader. April 12, 1833.—Our correspondent, as well as our readers in general, will be pleased to learn that, in consequence of the suggestion which we threw out two weeks ago, Mr. Jopling is engaged in the compilation of a small, cheap treatise on isometrical perspective, which will contain within itself every thing requisite to enable a person to make himself master of the art.—Ed. M. M.

INTERIM NOTICES.

The proof which our esteemed friend T. M. B. demands at our hands, involves considerations of considerable delicacy; but we shall see what can be done to place the fact beyond dispute. Suffice it for the present to say, that we personally *know* what we have stated to be true.

Θ. Hebert's, Cheapside.

Communications received from Mr. Baddeley—Mr. Edwards—F. H.—Mr. Hyde—X. Y.—Mr. Corbett—A Young Enquirer—Mr. Rutter—Mr. Deakin.

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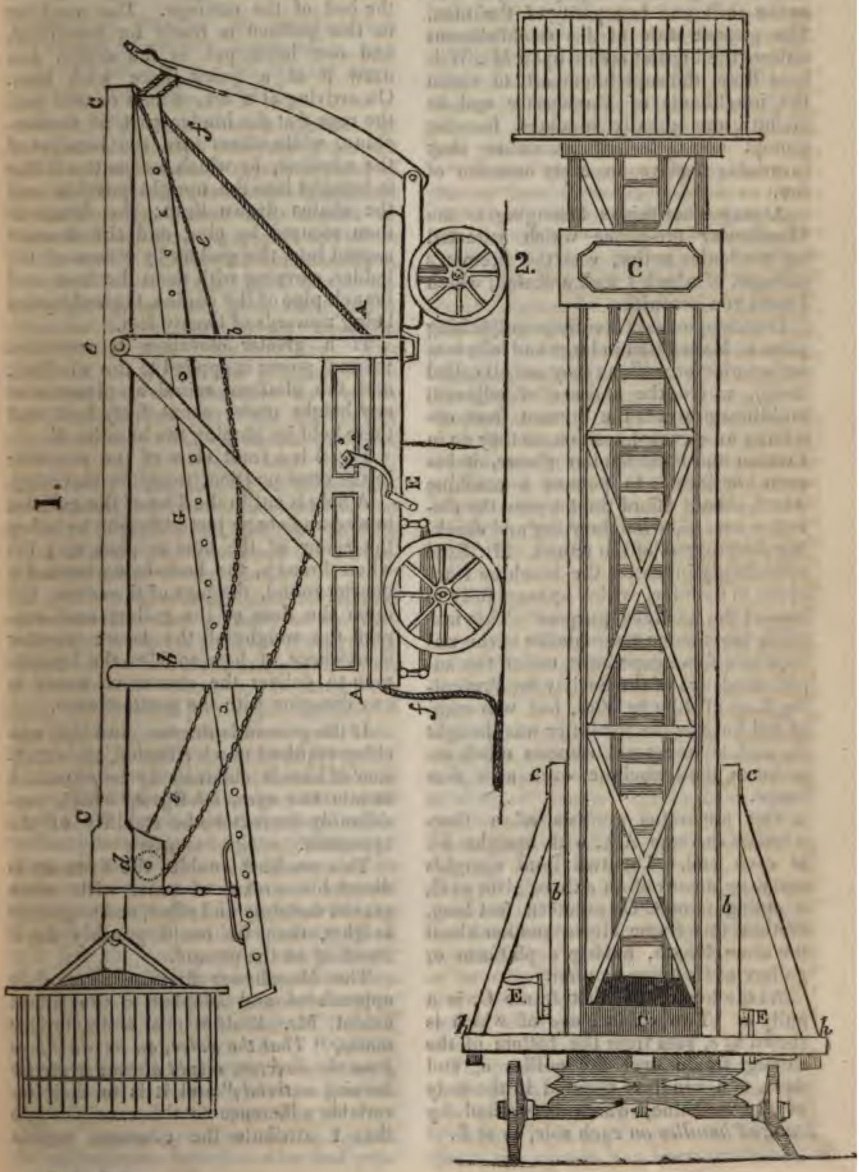
ROSE'S FIREMAN'S ELEVATOR.



ROSE'S FIREMAN'S ELEVATOR.

Sir,—During a recent short stay in Manchester, I had several opportunities of observing the operations of their admirable fire-police, and was much pleased with the excellent condition of their powerful fire-engines and equipment, as well as the skill and intrepidity of the men. The present state of this establishment reflects the highest credit upon Mr. William Rose, the superintendant, to whom the inhabitants of Manchester and its vicinity are greatly indebted for the prompt and effectual assistance they invariably receive on every occasion of fire.

Among other things belonging to the Manchester fire-police which attracted my particular notice, was the fireman's elevator, of which I took a sketch, which I send you herewith.

In consequence of fires frequently taking place at Manchester in large and lofty manufactories (or *mills* as they are all called there), where the absence of adjacent buildings prevents the firemen from obtaining an elevated position, as they do in London and other similar places, it became desirable to possess a machine which should afford the firemen the elevation necessary for observing and checking the progress of the flames. Mr. Rose accordingly invented the machine I am about to describe, which appears fully to answer the intended purpose. This machine bears some resemblance to the unfortunate fire-escape built under the superintendence of the Society for Preventing Loss of Life by Fire, but was completed long before the latter was thought of, and is in several respects much superior to that machine, even as a *fire-escape*.

The apparatus consists of a four-wheeled carriage A A, with uprights *b b* at each end. The two front uprights carry, by means of an axle or pivot at C, a strong fame C C, nineteen feet long. Within this frame slides another about the same length, having a platform or gallery at its upper extremity.

At the top of the first frame C, is a pully *d*. Two chains, one of which is shown at *e*, pass from the bottom of the sliding frame over the pullies *d*, and down to a windlass situated in the body of the machine, which is worked by cranked handles on each side, as at E.

A strong rope *f*, passes from the bottom of the principal frame C, round the windlass, and out at the back part of the machine. A ladder G is connected with the frame, so that when it is in the perpendicular position the ladder forms a communication between the gallery and the bed of the carriage. The machine in this position is ready for travelling, and one horse put in the shafts. can draw it at a quick pace with ease. On arriving at a fire, a man or two pull the rope *f* at the hinder part of the machine, while others turn the handles of the windlass, by which means the frame is brought into the upright position and the chains drawn tight; the frame is then secured by pins, and the firemen ascend into the gallery by means of the ladder, carrying with them the hose and branch-pipe of the engine, their elevation being upwards of twenty feet.

If a greater elevation is requisite, manual power is applied to the windlass, and the platform raised at pleasure to any height under about forty feet, and there held by pinning the handles E.

Fig. 2 is a front view of the machine in the erect position, ready for elevating.

A hole is cut in the floor of the gallery, in size and shape just sufficient to allow the screw of the hose to pass up; but when through, the hose being turned a quarter round, the lugs of the screw rest upon the floor of the gallery and support the weight of the hose; another short piece of hose enables the branchman to deliver the stream of water in any direction with the greatest ease.

If the ground is uneven, and the machine required much elevated, an extension of base is obtained by props, which fit into two eyes, *h h* fig. 2, which considerably increases the stability of the apparatus.

This machine enables the fireman to direct his stream of water with much greater certainty and effect, and to greater heights, than he could possibly do if standing on the ground.

The Manchester firemen have duly appreciated and adopted to the fullest extent Mr. Braidwood's characteristic motto, "*That the water, on its discharge from the director, should always strike the burning material;*" and it is to their invariable adherence to this excellent rule that I attribute the constant success

which always attends their exertions in the speedy suppression of fire.

I remain, Sir,
Yours respectfully,
W. BADDELEY.

London, April 16, 1833.

ARTIFICIAL CHECKS TO POPULATION, CHECKS TO VIRTUE, KNOWLEDGE, AND HAPPINESS—REPLY TO JUNIUS REDIVIVUS (last Vol., p. 437.)

Sir,—The gentlemanly notice by "Junius Redivivus" of my letter on "Education," inserted in your Journal of the 2d of March, demands my earliest attention; for I feel with regard to "Junius" as I do with respect to Robert Owen—while I differ with him in opinion, I cannot but admire his good intentions. I would not, however, have attempted a rejoinder to so powerful an opponent, were it not that I am confident "Junius" is too liberal not to grant every advantage to an adversary, as well as for the reflection that "the race is not always to the swift, nor the battle to the strong:" so, therefore, I shall proceed, after first noticing that in my former letter I merely adverted incidentally to the question of population, and that the drift of my arguments was to show the advantages of universal education.

I cannot agree with your invaluable correspondent, that a want of employment, and a want of food, are synonymous terms, while labourers are unemployed, and while store-houses are crammed with grain and other provisions capable of administering to the wants of man. Would "Junius" have asserted this, after a moment's reflection that the cultivated lands of Great Britain in 1831, were 25,684,600 acres, and the census taken for that year amounted only to 16,202,052? Here we have about 1$\frac{3}{4}$ of an acre to each individual; even let us suppose that the greater part is required for the support of cattle, still we have $\frac{3}{4}$ of an acre left for each person, which would be amply sufficient for his sustenance under a well arranged system of distribution. Let us look at the case of Ireland a short time back, when nearly 100,000*l.* worth of beef, pork, butter, &c., was exported from that country to the English markets, at the same time that we were obliged to send potatoes *over to support* the *unfortunate wretches who had produced* those articles of food, and preserve them from literal starvation! For the sake of argument, let us suppose that the food "exists not;" but if this be the case, have we not labour, and material on which that labour may be exercised, and more facilities than we have ever had for the production of it? And this surplus labour must be exercised in augmenting the produce, before food can be better distributed, and had in abundance among the lower orders; as it is only in times of scarcity that monopolists hoard their goods.

"Junius" smiles at my proposition of placing thirty-three labourers on an hundred acres; but we must not suppose that they are not to "stir off the 100 acres." Why not augment the quantity of land when their numbers increase? Suppose the 100 acres to be waste land, taken into cultivation: then surely the produce that it would yield is a consideration, and a very great consideration too; because the thirty-three families must be supported, whether there is additional produce or not. We must not suppose the 100 acres to represent Britain, and 132 persons the population; because, in that case, we have only 3 roods, 1 pole, and 1 yard to each person; whereas there are, in reality, 3 acres, 3 roods, and 18 poles for each individual; therefore, the position does not hold good.

"Junius" says, *educate the people*, and then they will be prudent enough to regulate the number of consumers of food by the supply. I say, *feed the people first* otherwise they never can be educated; and if, among the other good effects of education, population is thereby regulated, then, in the name of all that's good, let it be so. "Junius" admits that it is absurd to educate a starving man, and, at the same time, affirms that education is the only cure for the existing evils of society! Hence it is clear, by his own arguments, that the grand work of redemption must begin by attending *first* to the physical wants of man. And how is this to be done? Why, only by *making the lands already cultivated more productive, and by cultivating others now lying in waste.*

The produce of a farm is in proportion to the labour bestowed upon it; and the good effects of letting small allotments to labourers, in many counties in England where the system has been practised, is

obvious in the great reduction in the poor's rates, and in the well fed, healthy, and sober aspect of the labourers. Even in the time of Queen Elizabeth, the legislature perceived the good arising from this system, and it therefore enacted, that no cottage should be built without some ground attached to it. A law was passed in Henry VIIth's reign, against enclosures, and throwing many small farms into large ones, which law also directed, that the houses of the peasantry be kept in repair, in order that they might be tenanted, and the cultivation of the land better attended to. Sir John Carr, in his travels through Holland, in the year 1806, gives an interesting account of the happy effects of small farms in that country, (none exceeding fifty acres, and few of that extent,) which enable the peasantry to support their families in comfort, after paying a heavy tax of about 50 per cent. Mr. Rogers, in his travels in Holland, confirms this statement; and a subsequent writer, in speaking of that country, informs us that the Government build houses with small portions of land attached to them, and let them out to those who would otherwise become paupers, by their paying, as rent, the interest of the money expended; and those tenants who are industrious, have an opportunity of ultimately paying off the principal, thereby becoming, in the end, proprietors. Why not attach gardens and farms to our workhouses? or, rather, why not give able-bodied paupers the same opportunities which the Dutch people enjoy, that they may work out their own melioration, instead of being supported by the labour of others? Small farms have been found to answer in many parts of France; and in some parts of Hungary, where this system was adopted, and where the rents were paid by labour, the peasantry were raised from a state of wretchedness to wealth and intellectual improvement. Count Rumford praises the distribution of land in Bavaria, and adds, that in every garrison of soldiers, where they are permanent, each soldier has a piece of ground allotted to him. Would that the idle regiments we see stalking about the streets of London every day, had some such like employment, and that they were obliged to earn their bread before they eat it, instead of being sustained in idleness out of the *pockets of the people!* Even the slaves of the British and Spanish sugar-islands are allowed small pieces of land, which they cultivate on holidays;—so that the slave-drivers of the West Indies have surpassed the British aristocracy in humanity, or rather, I should say, the former have not equalled the latter in cruelty! Yes, cruelty, Sir; for what can be more so than driving small holders from the soil, displacing their dwellings, and substituting cattle for human beings? The poor of this country want nothing from the rich that may be considered a favour;—no, we ask for nothing in their behalf, in the shape of beggarly alms—we only ask for that which would prove even more advantageous to the landowners than to the labourers themselves. But this they are loth to grant, lest they should lose their dominion over the poor. But will they retain it long? No, it will be wrested from them, and they cannot help themselves.

Again, "Junius" will say, "oh! think of the extra surplus produce that the farmer of eighteen children on an hundred acres would have for sale, compared with the produce of the thirty-three small families." But he must remember that, while the former holds the land, there are thirty-two more families to be supplied out of the public fund of food. Let the farmer first supply those families, and then his own family, and what will he have left for sale? Even Mr. Malthus (who has changed his opinions nearly as often as Cobbett, and as unblushingly as Brougham*) has, in the fifth edition of his "Essay on Population," recommended the extension of agriculture; and although, in the first and second editions of this work, he allowed no check to population but depravity and wretchedness, yet, in his "Principles of Political Economy," published at his death, he says, "a fertile soil and an ingenious people

* The writer alludes, we presume, to the Lord Chancellor's recent change of opinion on the subject of the education of the people. His Lordship now thinks that a legislative provision for the establishment of schools in every parish—as in Scotland—is not half so good a plan as leaving the poor dependent for knowledge on the benevolence of the rich,—these same rich having already placed beyond all doubt the strength of their affection for the poor, by systematically turning them out of every endowed school to which they had a right of admission; and the said Lord Brougham having, while yet a commoner only, been the principal instrument of exposing their injustice in this respect to the world!—Ed. M.M.

can not only support a considerable portion of unproductive consumers without injury, but may absolutely require such a body of demanders, in order to give effect to their power of production. "Junius" will say, "but if the thirty-three labourers are placed on the hundred acres, they will increase their numbers faster than the farmer's family can." Will they not increase whether they have land or not? and must they not be supported whether they have the means of producing their support or not? If surplus produce is the desideratum, why not work our natures up to a Hindostan pitch, and commit the crime of infanticide? Why not strangle all those in infancy who are lame, decrepit, insane, or otherwise incapable of producing their sustenance? What a pity it is that vaccination of children was ever introduced! Oh! for a Herod to reign in "Babylon the Great!"

But, to view the matter more calmly, are the people to be starved lest their numbers should increase? For it is, after all, a very wrong notion that bettering the condition of the poor induces them to marry, and thereby increase their numbers; for we have frequently, if not always, seen it have the contrary effect. The author of the "Peasant's Voice," in speaking on this point, very justly observes, that "the idea that a certain degree of comfort causes an increase of population is visionary. To prove the fallacy of it we need only look at the numerous progeny of our half-starved labourers, and compare it with the progeny of those who spend more for a dinner and wine, on a market day, than they give to support the family of a labourer for a week, some of whom have not even a child to inherit their property."

I agree with your valuable correspondent that man is not exempted from the laws that govern the rest of organised nature; but the animal kingdom is not so capable of increase as the vegetable kingdom, and man is even less productive in this way than the inferior animals. This is partly the effect of reason, but chiefly the effect of the physical condition of the species: so that "Junius" need not be at all alarmed about the approach of the time when men, from their immense numbers, will devour one another. It is too airy a speculation to be indulged in for a moment: even Mr. Malthus, who painted in the darkest colours the horrors of over-population, does not anticipate such an event; for we have, alas! too many positive checks that we never can get rid of to prevent it. When "Junius" remembered so well the countries that are over-peopled, and the races that prey upon one another, I wish he had also given us an account of the many fertile fields and flowery vales that spread their luxuriant verdure over vast tracts, where the foot of man has never trodden—where the sweet melodious notes of the feathered tribe are only answered by the echo,—and where the howling of beasts alone disturbs the gloomy silence. He forgets to notice many countries, the earth and air of which are rendered obnoxious, and even pestilential, for want of people to purify it. He forgets that the air of many parts of the once well-peopled and healthy Roman territory has, from the decline of population, become insalubrious; and he also forgets that in many parts of the world the decrease of population is as great as the increase. In short, he forgets to notice the too limited cultivation of the world throughout.

The grand object of education should be one of the means of increasing the production of food and rational enjoyment, and securing the permanence of the natural laws of distribution. An increase of population is an increase of labourers or producers, and, what is more, an increase of minds; the result of which will be an increased produce, and an increased exaltation of the species from the aggregate capabilities of those minds. But "Junius" only contends for "the gradual increase of food to precede the gradual increase of numbers:" so does every well thinking person; but we must recollect that a preventive check against the increase of numbers is a positive check against the increase of labour and labourers, and consequently of produce; and it is not too much to suppose, as every man can produce more than he can consume, that, under a well organised and well governed system, the greater number of labourers the greater relative produce.

I dislike spade husbandry, and consider it a waste of labour, as much as any one; and I look upon machinery, or anything else that abridges labour, as the greatest blessing that a country can possess, and this blessing will be ultimately felt; but

in the meantime, as we are not a band of brothers with one common interest, and as there is no union or sympathy between the rich and poor, it is a temporary evil. The rich monopolise it; and although the poor can have every thing cheaper by machinery, it matters not to them, for, if a month's food could be had for a farthing, if they have not got that farthing they cannot have the food. But "Junius" will say, that, "after all, the monopolist is only a distributor; let us, however, look at the inequality of the distribution, and every extensive distributor becomes a non-producer, and adds another weight to the poor man's burthen.

Again, I do not consider that it is at all necessary to educate the people for the express purpose of regulating the population; for, although there may be a few despicable wretches—though I trust they are few—who might enter the marriage state without any better prospect than parish relief, will "Junius" affirm that men in general have no considerateness in matters of such importance? Surely no one with a mind and a nature superior to the brute creation, would exclude all moral restrainst from the procreation of human beings? No: as a proof of this, we have only to add, that the amount deposited in saving banks in Great Britain, chiefly by mechanics and half educated individuals, is nearly a million sterling. It is a wrong idea, however, when we trace the principle of the thing to its foundation, that only monied men should have children: it is the man who produces more than he consumes who ought to have them; because the rich man, however great his wealth may be, adds consumers without increasing the produce. Certainly a man who abstains from marriage until he can begin the world with comfort, may be considered a prudent man, but I question much if he would not be equally happy if he obeyed the first impulses of nature; for, although he might in that case have a large family, and therefore require to toil harder for their support, he would save himself from the corrupting influence of those evil courses into which young men are too commonly betrayed when marriage is protracted.

> "The sacred lowe o' weel-plac'd love,
> Luxuriantly indulge it:
> But never tempt th' illicit rove,
> Tho' naething should divulge it.
> I wave the quantum o' the sin,
> The hazard o' concealing:
> But oh! it hardens a' within,
> And petrifies the feeling!"

I trust that I have said enough to shew that small allotments of land are calculated to redeem from misery the working classes; because artisans must stand or fall with agricultural labourers. It has been said that the working classes will never be redeemed from wretchedness until they set about it themselves; but, in the name of reason, can a people assist themselves who have hitherto had no voice in the Legislature, the appointment of magistrates, or other official officers? "Go to, I will not hear of it."

We trust that *a* Reformed Parliament (I wish I could have said *the* Reformed Parliament) will consider that, while the people are starving for want of food, there are, in the State, more than 30,000,000 acres of uncultivated land. The people have been long enough gulled by canting hypocrites and demagogues on the one hand, and by tyrants without limit on the other. Indeed, they themselves begin to see that they are oppressed, and to feel the tyrant's rod. Reason has arisen, and is on the wing, and in spite of all the obstacles she has to encounter, she will soar above them in defiance of her adversaries!—The days of slavery are now at an end; the time has arrived when we retain customs, not for their antiquity, but for their utility alone. The slave-drivers of Britain shall no longer reign over and oppress the innocent; their power is crushed by the awakened spirit that has slumbered for ages under the veil of superstition. We have shivered the chains of despotism, and now we are about to seize on our birthright of freedom.

Then, to complete the grand work, let us endeavour to extend the science of agriculture, that the people may progressively advance in intellectual education. As to population, "let time and chance determine." When there are no materials for the ingenuity of man to work upon, *then* let the object of education be to regulate the population; but I cannot consent to it now while there are in the world *twenty-nine* acres of land for each individual in existence. No, Sir, I cannot even consent to it while there is so much land in our own country that has never been disturbed by spade or plough—

while bog, and other waste lands, are capable of being made productive in Ireland—while the vast extent of country in America is susceptible of being cultivated—while many of the fertile plains of Africa are unproductive—while the deserts of Arabia are desolate—while the interior of Asia is inhabited by wild beasts and forests; nay, while the tops of the Andes, the Pyrenees, and the Alps, are uncovered with crops for the sustenance of man; in short, while the sea can reach, or its wide waters lave one uncultivated shore throughout the world! Nor will I stop here. We shall then have floating gardens! Aye, floating gardens, more extensive than the Chenampas of Mexico, or those on the rivers and canals of China. And when the whole surface of the earth is covered, and as much of the waters as is practicable; in fine, when this world is completely exhausted we must then imagine a new one, and have our corn fields placed on artificial galleries! Yes, artificial galleries, placed one above another, like the boxes of a theatre, or rather like the shelves of a flower stand, and supported by cast iron pillars. Here, Mr. Editor, here is scope for mechanical invention! Think for a moment of all the cranes, bolts, hooks, cranks, wheels, engines, and all the other mechanical devices and instruments, that will be required in hoisting and lowering goods from one gallery to another! Think of the powerful steam-engines that will be required to print their "Mechanics' Magazines!"

When all this is accomplished to its fullest extent, *then* let the express purpose of education for the working classes be, to stop population. "Junius," I am sure, would like to see the inventive genius that all those galleries would call in question. Yes, "Junius," I am confident that thou lovest to see the people happy and improving; this is shown in all thy actions; thou art the people's advocate, the breaker of the shields that defend tyranny, and wrestler with the abuses of thy country! Then gird thy weapon on thy thigh, thou powerful man of might. I shall prolong the contest with thee until truth has conquered; and should I fall beneath thine arm, I am confident that my consolation will be greater, and my treatment better than the victim of St. Helena—because my cause is good, and thy nobleness will disdain to insult my prostration.

I remain, Sir,

Your's respectfully,

R.

Bayswater, April 15, 1833.

ON SUGAR-HOUSE STEAM-ENGINES.

In sugar-house steam-engines, of the ordinary construction, there is one air-pump and condenser to the engine, and another air-pump with a separate condenser to each of the vacuum pans. It would very much simplify all the parts, and answer every purpose as well, to make one *large double acting air-pump* work both the engine and the pans.

Having the cold water pump (which in this sort of engine is so very large) *double-acting*, and so constructed that it shall discharge its water *directly* into the condenser, the pressure of the atmosphere on its bucket will give very considerable additional power to the engine. The water may be as effectually separated and spread about in the condenser in this plan as in the common way, by making it pass through a cistern having small holes in its bottom, and then dash upon flat plates in its descent in the condenser. There must be provision made for lengthening or shortening the stroke of the pump so as to give cold water in proportion to the quantity of work performed at any time. Two of the valves will be self-acting; the other two must be wrought off the engine.

As the pressure of the atmosphere is only on the bucket of the air-pump when its discharging valves are open, when the engine is working without the pans, the vapour to be condensed, the quantity of water required to condense it, the portion of the stroke during which the discharging valves are open, and the supply of steam from the boiler to work the engine, will still keep in proportion to the work the engine is doing, and not much more power will be required to work this large air-pump, even at this time, than if it were of the ordinary size.

Different degrees of vacuum may be had in the pans, without altering the degree of vacuum in the condenser, by having regulating stop-cocks in each of the pipes that connect the pans with the condenser.

JAMES WHITELAW.

E, a tin tube for supplying the reservoir with spirit.

F is a glass cover with a wide neck (this glass is precisely similar to the common deflagrating jars); it rests upon a tin ledge, soldered inside round the rim D, above the air-holes.

G is a tin tube or chimney, which rests upon the shoulders of the glass cover F.

H is a screen made of tin, which is large enough to surround the glass cover, and to leave a space an inch distant all round it. This screen is supported by a projecting rim of tin at the bottom, on the same ledge that the glass cover F rests upon. It is advisable to have the interior surface of this screen lined with some material that is a bad conductor of heat.

I is a glass flask or retort, rounded at the bottom, which is placed upon a brass ring, supported by three legs. It is necessary to have all retorts that are used, perfectly rounded at the lower part, in order that, when the apparatus is adjusted, the retort will be at an equal distance, not to touch, but to be nearly in contact with each of the platina balls.

Belonging to the furnace is a tin cover, which is used when the apparatus is at rest. The screen and glass cover are withdrawn, and a tin cover is placed over all the burners, and rests upon the top of the reservoir, covering the rim perforated with air-holes. The tin serves as an extinguisher, it prevents the spontaneous evaporation of the spirit, it protects the platina balls from injury, and preserves all clean. The whole of the tin-work is japanned externally.

When an experiment is about to be performed, the tube G is taken off, then the screen H, afterwards the glass cover F. The wicks are then to be saturated, by dropping stronger alcohol upon each of them, after which they are to be lighted; in a few seconds the platina balls become red hot, the flame is then blown out, the retort with its contents is fixed on the brass stand, which is placed within the circle of the twelve burners. Then the glass cover, screen, and tube are replaced as before.

The best and neatest mode of setting the apparatus into operation, is to render each of the platina balls incandescent, by means of the blowpipe and spirit lamp; as soon as the balls are red hot, the vapour of the spirit is excited, and renders the dropping of stronger alcohol quite unnecessary. For this suggestion I am indebted to Professor Christison.

When it is wished to have any lower degree of temperature, the experimenter has only to withdraw some of the brass tubes, in doing which he takes away at the same time the wicks and platina balls; corks must then be placed in the tin tubes, to prevent the unnecessary evaporation of the spirit.

MR. BABBAGE'S NEW COINAGE.

Sir,—As the conclusion of your last editorial note on Mr. Babbage's new coinage seems to demand a reply from me, I must trouble you with a few more words on the subject; although that note, as it throws no new light on the matter, would otherwise scarcely have called for a rejoinder.

You observe, that I confound one period of the operation of the projected change with another; that therein consists the fallacy of my positions; and that "the question is not what effect the change will have on *after* transactions, but transactions finished and complete at the time of its coming into operation." Now, as I cannot grasp the meaning of this assertion, of course I can hardly be expected to reply to it. I thought the question was precisely what the effect of the alteration would be on payments to be made and transactions to be concluded after it had been effected. Indeed, what we have to do with transactions "finished and complete at the time of its coming into operation," I cannot conceive. I do not, therefore, see through my error here.

In commenting on the penny-loaf case, you beg your readers to mark the "*after*" in my question, "Whether any baker would make his penny loaves of the same size *after* the reduction as before?" and then make the observation I have quoted above. To see how it will apply, we will suppose Mr. Babbage's act to come into operation to-day. The question then is not what effect the measure will have on the size of the penny loaf *now*, *after* its coming into operation, but what effect it *will* have on the size of the penny loaves baked last week, or last year! Is not this a bit of a bull? In fact, is it not rather Hibernian to talk at all of changing transactions already finished and complete, more especially by a measure entirely prospective?

Now for the newsman, who has taken the place of the baker. Here I am at fault again, and obliged to resort partly

to guess to make out what is intended to be conveyed. I suppose, then, that you intend to point out what a loss would be sustained by a newsman who had contracted to take 650 copies of the Mechanics' Magazine at £5, when the price of the work should be reduced from 3 of the old pence to 3 of the new. There can be no doubt that he would lose a portion of his profits; and so he would if the work should be reduced in its price at any time. But is it to be supposed, that if, for instance, the Mechanics' Magazine were to be reduced next week to two-pence or a penny, the newsman would contentedly go on paying his £5 as before? No, the contract would be broken, and a new one must be made; just so in the case you have put. If you reduce the selling price of your publication 4 per cent. or 40, you must, of course, reduce your charge to the trade in the same proportion, whether you have contracted with them or no, *since your agreement with them is to supply a work of a certain selling value.* You will say, perhaps, that the value is not *apparently* changed, but, of course, the Act for making the alteration will provide for all such cases. The newsman would, therefore, have to pay the publisher—if you reduced your price to three of the new pence—instead of £5 a week, only £4 16*s.* By this arrangement, you will say, he will lose 2*s.* 6*d.* a week. True; but this is solely the effect of the reduction in price—he will obtain the same profit per cent. as before: but he must be a fool to expect to gain as much from the sale of a shilling book as he would from a guinea one—or from 650 pamphlets at 2¾*d.* (or thereabouts) as from the same number at 3*d.*; in other words, to get as much interest for £4. 16*s.* as for £5.

If, as you say, (but I deny) his obligation to pay the publisher the £5 would remain the same as before, the case would be different; not because he could obtain less of other money for his 750 pence of profit, (on which alone you seem to rely), but because he would not obtain 750 pence of profit at all—if he could, he would have nothing to complain of, as I have just explained. (Nay, I have, perhaps, gone too far in allowing that he would not obtain the very same amount of profit at the reduced price as at the higher one; for will not his 750 pence buy him 750 penny loaves—and what more could they do before?) If, however, he went on paying the £5, his profit would be only 700 pence on the 650 copies, inasmuch as he would receive 1950 pence, and pay twelve hundred *and fifty* (not 1200, as under the old system). But reduce his payment in the ratio of the *reduction in the price* of the work, or keep up the work to its old price, and all will be fair.

I have said that I have been partly compelled to guess at your meaning—if, therefore, I have mistaken it, I crave pardon: but I really cannot comprehend the calculations in this case of the newsman, more especially that which makes out that 750 of the new pence will be equal to "59 shillings, or 2 sovereigns and 19 shillings (+ 10¾*d.*)"—will you be kind enough to explain? I make it just £3, neither more nor less. The loss on £5, at 4 per cent., I reckon at 4*s.*, not 4*s.* 2*d.*; nor can I see how the calculation you enter into proves a loss to this amount. I suppose the printers must have been terribly at fault here; and I have suffered from them as well: they make me propose an issue of twenty-five new pence for every twenty-*six* of the old, instead of every twenty-*four*.

In conclusion, I am sorry to have to complain that you scarcely do me justice in reiterating that I admit there would be a confiscation to the amount of 4 per cent. on all the copper in circulation; and that, too, while you are remarking on the very letter in which I have twice explained that the confiscation in question would only be produced by arbitrarily reducing the value of the copper coin now in circulation—a measure which is by no means essential to the alteration proposed, and which I never proposed to resort to. You will also allow me to observe, that your last note contains nothing in proof of the proposition I combat, viz. that the change would work a confiscation of 4 per cent. on all fixed payments made after its being carried into effect. If I were to admit all you now contend for, *i. e.* that the *new* penny loaves would be as big as the old ones—and that you would be willing to give your readers as much for 2¾*d.* as you do now for 3*d.*, the whole question would be any thing but decided. Hoping, therefore, that, on re-consideration, you will

perceive the fallacy of the objection which, I am sorry to observe, you still persist in.

I remain, Sir, yours obediently,

F. H.

London, April 16, 1833.

"F. H." is very obstinate, and, but that he is so *remarkably* candid and modest, we should say wilfully so. We fear our readers will scarcely be pleased with us for admitting more words about so plain a matter; but we trust they will make due allowance for the considerations of delicacy which must influence an Editor when he is so situated that he cannot refuse a further hearing to an antagonist without subjecting himself to the suspicion of having had recourse to an exercise of prerogative, to screen a defeat in argument.

"F. H." *affects* not to be able to "grasp the meaning" of transactions being "finished and complete" at the time of such a change in the coinage as that proposed taking place, and yet being influenced by that change. This is mere verbal quibbling. A bargain for an irredeemable annuity is, in legal parlance, "finished and complete" when the consideration is paid and the bond signed; and that whether the annuity is afterwards duly paid or not, or in coin of the same real value or not. According to "F. H.," it could *never* be complete, because the annuity is *never* to come to an end!

"F. H." *affects* also to be at a great loss "to make out what is intended to be conveyed" by the case of the newsman, and to be "compelled to guess at our meaning." May it not be owing to his high stilts that his head is so constantly in the clouds? At all events, he guesses shrewdly to be so slow of understanding. He has absolutely guessed our meaning so well that he has been obliged to knock under to it. "*There would be no doubt*," he says, "that he (the newsman) would lose a portion of his profits," "but, *of course*, the act for making the alterations will provide for all such cases." He admits the loss, which is all we contended for, but maintains that it would be met, "of course," by an equitable adjustment. We do not see how this follows as a matter "of course," and can imagine, on the contrary, an infinity of cases which no "act" of the legislature could provide for; but, be this as it may, it is enough for our present purpose that there could be no need of an equitable adjustment but for that inequality in the operation of the projected change which "F. H." has so idly disputed.

Another thing which "F. H." *affects* to be really unable to "comprehend," is how 750 of "the *new* pence" will be equal to fifty-nine shillings, or two sovereigns and nineteen shillings (+ tenpence and three farthings.) Now the difficulty of comprehension here arises from his ascribing to us words we never used. We did not speak of *new* pence, but of *old* pence passing current at the rate of 12½*d*. for a shilling, as proposed by Mr. Babbage. And certain it is that the product of $\frac{750}{12\frac{1}{2}}$ is 59*s*. 10¾*d*.

"F. H." denies, in conclusion, that "the change would work a confiscation of 4 per cent on *all* fixed payments made after its being carried into effect." We shall leave this denial of his to count for what it is worth, and content ourselves with observing, by way of conclusion to what *we* have to say on the subject, that though one can see very well how, on general principles, every change in the value of money must for a time be attended with loss to somebody or other, it would require much higher talents than any which have been brought to the present discussion, to trace the operation of that change through "*all* its" ramifications. —Ed. M.M.

NEW SUBSTANCE OBTAINED BY ELECTRIFYING SULPHUR.

Sir,—I take the liberty of informing you that I have obtained a substance, which I have called Thiogen, by electrifying sulphur by means of a metallic lightning-rod. I also obtained from the sulphur at the same time a considerable quantity of hydrogen. If you think this communication worthy of a place in your valuable publication, I will send you the particulars of my experiments for a future Number.

I am, Sir, your obedient servant,

J. M. Corbett.

Salop, April 15, 1833.

[We shall be glad to receive the particulars of our correspondent's experiments.—Ed. M. M.]

ıess to make out what is intended to ɔnveyed. I suppose, then, that you ıd to point out what a loss would be ined by a newsman who had con- ed to take 650 copies of the Mecha- Magazine at £5, when the price of vork should be reduced from 3 of the ence to 3 of the new. There can be oubt that he would lose a portion of rofits; and so he would if the work ld be reduced in its price at any But is it to be supposed, that if, nstance, the Mechanics' Magazine to be reduced next week to two- e or a penny, the newsman would ntedly go on paying his £5 as be- No, the contract would be broken, ı new one must be made; just so in case you have put. If you reduce elling price of your publication 4 ent. or 40, you must, of course, re- your charge to the trade in the same rtion, whether you have contracted them or no, *since your agreement them is to supply a work of a certain g value.* You will say, perhaps, he value is not *apparently* changed, of course, the Act for making the tion will provide for all such cases. newsman would, therefore, have to he publisher—if you reduced your to three of the new pence—instead 5 a week, only £4 16*s*. By this gement, you will say, he will lose . a week. True; but this is solely ffect of the reduction in price—he btain the same profit per cent. as : but he must be a fool to expect n as much from the sale of a shil- book as he would from a guinea or from 650 pamphlets at 2⅞*d*. (or bouts) as from the same number at in other words, to get as much in- for £4. 16*s*. as for £5.

as you say, (but I deny) his obliga- pay the publisher the £5 would n the same as before, the case be different; not because he could less of other money for his 750 of profit, (on which alone you seem), but because he would not obtain ence of profit at all—if he could, he have nothing to complain of, as I ust explained. (Nay, I have, per- gone too far in allowing that he not obtain the very same amount fit at the reduced price as at the one; for will not his 750 pence buy him 750 penny loaves—and what more could they do before?) If, how- ever, he went on paying the £5, his pro- fit would be only 700 pence on the 650 copies, inasmuch as he would receive 1950 pence, and pay twelve hundred *and fifty* (not 1200, as under the old system). But reduce his payment in the ratio of the *reduction in the price* of the work, or keep up the work to its old price, and all will be fair.

I have said that I have been partly compelled to guess at your meaning—if, therefore, I have mistaken it, I crave pardon: but I really cannot comprehend the calculations in this case of the news- man, more especially that which makes out that 750 of the new pence will be equal to "59 shillings, or 2 sovereigns and 19 shillings (+ 10⅞*d*.)"—will you be kind enough to explain? I make it just £3, neither more nor less. The loss on £5, at 4 per cent., I reckon at 4*s*., not 4*s*. 2*d*.; nor can I see how the calcula- tion you enter into proves a loss to this amount. I suppose the printers must have been terribly at fault here; and I have suffered from them as well: they make me propose an issue of twenty-five new pence for every twenty-*six* of the old, instead of every twenty-*four*.

In conclusion, I am sorry to have to complain that you scarcely do me justice in reiterating that I admit there would be a confiscation to the amount of 4 per cent. on all the copper in circulation; and that, too, while you are remarking on the very letter in which I have twice explained that the confiscation in ques- tion would only be produced by arbitra- rily reducing the value of the copper coin now in circulation—a measure which is by no means essential to the alteration proposed, and which I never proposed to resort to. You will also allow me to ob- serve, that your last note contains no- thing in proof of the proposition I com- bat, viz. that the change would work a confiscation of 4 per cent. on all fixed payments made after its being carried into effect. If I were to admit all you now contend for, *i. e.* that the *new* penny loaves would be as big as the old ones— and that you would be willing to give your readers as much for 2⅞*d*. as you do now for 3*d*., the whole question would be any thing but decided. Hoping, there- fore, that, on re-consideration, you will

United States for 120,000 tons of shipping annually; and that the Spanish islands of Cuba, St. Domingo, and Manilla, furnish freightage for 200,000 tons annually to the United States. Mr. Pitkin tells the Brazilians the dollar is worth six shillings: Mr. M'Culloch tells the Brazilians that the said dollar is worth but four shillings! Dean Swift observed, that the world must be circumnavigated before the washerwoman can call out, "Jenny, put the kettle on." Coming home from China with the tea, we must put into Rio to discover that there are 16 Portuguese ounces of sugar to the English pound weight of sugar.

In 1793, four years previous to the suspension of cash payments, the French Academy of Sciences declared, in the legal, equitable, aye, and mathematical, law of the Great Charter of England, that, "with two standards of weight there could be no *honest* system of accountability." Commercial science had been previously attended to by the *Fermiers Generaux*, and a certain class, who were used to turn out from the Faubourg St. Germain in top-boots, cocked-hat, and salmon-colour umbrella, exclaiming, "*Laissez nous faire*"—"give us a plurality of wives"—"we are free traders."

Mr. Bates, who has resided at Canton, and Mr. Thornely, of Liverpool, have proved to Parliament, that the *par* of exchange between Asia and America is 720 cash for the dollar: Mr. M'Culloch values the dollar at 420 cash! As Mr. Rothschild has stated to Parliament, the Mexican dollar is the only coin which circulates throughout the world. During the war there were no less than *three* English values for this monetary unit!!!

1st. The Irish.................. 72 pence.
2d. The Bank of England..... 60 do.
3d. The foreign war *par*....... 54 do.*

Upon winding up the account there was a "*mistake*" committed to the amount of £58,064,532. I shall give the data to our political economists.

$$\left.\begin{array}{l}\dfrac{934\cdot5}{62}=15\cdot0725\\[2ex]\dfrac{934\cdot5}{66}=14\cdot159\end{array}\right\}\text{pounds weight of silver for one pound weight of gold.}$$

Then £46 14*s*. 6*d*. : ·91349 × 66 :: 100 : = 6·4516. Thus taking the debt in 1819 at £900,000,000, we have the result, less the half-yearly interest.

* *From analysis of Mr. Rothschild's evidence (see Mech. Mag., No. 477.)*

It is an established principle of this branch of science, that, if the weights and measures be wrong, the accounts must also be wrong; for, as the labourer wields the weights and measures physically, so must the accountant figuratively.

Foreigners do not understand our scientific *patois*. In Spain, 100 pounds are not 112. Neither is the quarter of 2,000 pounds, 560 pounds. Nor are 1000 × 5 = 5,280 feet. It ought to be borne in mind, that the East Indians and French Canadians do not speak English, though they agree with Mr. Locke, that "number measures all measurables," Mr. Richards, in his official and able Report to the Colonial department, states that the inhabitants of Upper and Lower Canada have been involved in law-suits. By whom? The land-surveyors! While the Surveyor-General, Colonel Bouchette, states, that the poor emigrant receives more than double the space he can cultivate.

Mr. M'Culloch is pleased to assert that Mr. Bailly was altogether wrong in supposing that the measures of the ancients were deduced from a natural basis; and then goes on to assert, that 12 quarters of corn are the tithe of 100! Will Mr. M'Culloch admit that every unmutilated man has 10 fingers, and 2 feet? The water-carriers' load was, and continues to be, the wholesale weight. The exchanges of the majority of the world are derived from the English foot. The Hindoos told Bailly that there are 365 days to the year, and 365,000 feet to a degree of the meridian. Praise is generally most stupidly impertinent. It is not for me to vindicate the memory of Bailly, or the memory of King Alfred, who founded the deci-mil system. But this I do assert, that unless the duties, taxes, rents, and rates be reduced from the Old England to the New England scale, there can be no free trade to the East Indies and China.

T.

THE PADDINGTON STEAM CARRIAGE COMPANY.

A steam omnibus, constructed for this Company, on the plan of Mr. Hancock, has at length made its appearance on the road between the City and Paddington. We saw it at work on Monday, Tuesday, and Wednesday last, and were very well pleased with the manner of its operation.

It seemed to be as perfectly under the regulation of the steersman as any of the rival vehicles drawn by horses, went a good deal faster—as much so, perhaps, as the crowded state of the road would allow, and caused no annoyance by noise or smoke to either bipeds or quadrupeds. In external appearance it differs little from an ordinary omnibus, and contains accommodations for exactly the same number of passengers. The part for the passengers is in front, the furnace in the rear, and the engine work (which occupies but a small space) between the two. The motive power is communicated by chains, and to one wheel only. The internal arrangements are, we believe, similar to those of the carriage made by Mr. Hancock, which plied for some time on the Stratford-road, and is fully described in the Mechanics' Magazine for the 28th April, 1832. All that (apparently) now remains to be done, is to ascertain the average cost of this mode of conveyance, as compared with horse power; and this, of course, must be an affair of time. We trust the Paddington Company will act more openly by the public in this respect than previous speculators have done; and that they will make known the result of their experience, whatever it may be, without any mystification or evasion.

Since writing the preceding notice, we have received the following very frank and satisfactory letter on the subject from a shareholder of the Company:—

Sir,—The London and Paddington Steam Carriage Company have tried and proved the effectiveness of their carriage, by taking it from Paddington to London-wall, and thence up Houndsditch, through Whitechapel (on market day), and on to Stratford and West Ham, and returning the same way back again; thus proving its capability of proceeding through crowded thoroughfares without inconvenience or liability to accident to the persons in the carriage, or others. We have also on Monday begun to ply to and from Paddington to the City for hire; and intend, for the present, continuing to go once or twice a day for the purpose of developing the wants of the road, and also such imperfections as may appear in practice, in order that we may remedy them in the other carriages in progress of preparation. As soon as we have got two more carriages ready, the whole three will commence running in regular succession on this line of road, each carriage performing fourteen journeys to and fro per day, which is nearly the work of three omnibuses and thirty horses. During the early journeys of this single carriage, the fare will be one shilling. We do not, however, wish people to think we have commenced business as we mean to go on; for, at present, we are really only going for the purpose of satisfying the public of the safety and perfect practicability of this mode of travelling, and also of getting practice on the road, so that we may find out and apply every improvement that may be requisite. When the novelty of the thing has worn off a little, it is to be hoped that the road will not be so crowded with curious gazers as it is every time we now go out, to the great prejudice of the speed of the vehicle, which it requires no small portion of skill and care on the part of the guide to steer with safety through the multitude of coaches, gigs, carts, drays, &c., that constantly beset its path. As it is, a second journey each day would, *at present*, become a perfect nuisance; but as soon as the road, by our frequent journeys, becomes less crowded, we shall, even with the one carriage, go two or three journeys occasionally, *perhaps more*, as soon as we are satisfied that we have adopted every improvement in strength and quality that daily practice may show to be necessary. The carriage has been open to public inspection on these premises for nearly three months; but, now that we go out daily, strangers are not admitted on any account, as it would interfere too much with the regular business of the establishment, and also with the progress of the other carriages.

I have now, Sir, presented you with a few *facts* as to the present and future; and facts only, for I hate puffing and lies as much as you can do in a great national matter like this. I do not know whether I am too sanguine or not, but I conceive we shall be able to satisfy the public that the important question as regards steam-travelling on common roads —*to be, or not to be*—will now be solved.

I am, Sir, your obedient servant,

CANDIDUS.

London and Paddington Steam Carriage Company's Office, 68, Charles-street, City-road, April 24, 1833.

Oil-tight Fabric.—Sir,—In an apparatus which I am constructing I require a vessel to contain oil, of the form of a common mug without a handle, with a top and bottom of hard wood, and *the sides of some flexible material that will be perfectly oil-tight even under considerable pressure*, so that when the top of the vessel is pressed down, the sides may give way in folds, and the oil be forced out through an opening in the bottom. I am informed that Indian-rubber cloth will not hold oil. Any of your correspondents who may be in possession of the information I require, will much oblige me by communicating it to me through your pages. Your very intelligent correspondent, Mr. J. O. N. Rutter, in a recent Number of your Magazine, obligingly offers to inform such of your readers as may wish to know, the process of making Indian-rubber balls; and as I conceive that I can make them subservient to a useful purpose, he will much oblige me by acquainting me with the mode that he adopts for the purpose.—I remain, Sir, yours very sincerely, A CONSTANT READER. April 1, 1833.

Hot-water Pump.—Sir,—I have a plunger-pump placed 15 feet above a cistern of hot water constantly varying from 100° to 200° Fahrenheit. It frequently generates steam instead of raising water. If any of your ingenious practical correspondents are aware of an expedient to ensure an uninterrupted supply of hot water, it would be an acquisition to A SUBSCRIBER.

Ball-Cocks.—Sir, I observe in the Mechanics, Magazine for May 14, 1831, that Mr. Baddeley has brought before the public an improved ball-cock for a water-cistern. I am confident that Mr. Baddeley would not intentionally pirate any other's invention; I therefore inform him, that a ball-cock *exactly* similar to his was presented to the Bath Agricultural Society, Dec. 17, 1822, by Rear-Admiral Bullen; and for which ingenious invention he was presented with a silver medal by their President, the Marquis of Lansdowne.—Yours, &c., EQUITY. Bath, April 10, 1833.

Mile-Houses.—Sir, I beg to inform you that you are under a mistake in supposing that the erection of mile-houses originated with a correspondent of yours. The plan originated with Buonaparte when ruler in France twenty years since; and I believe was acted upon on some of his new roads. Sir Richard Phillips took up the subject at *that time*, and published a good deal upon it in his *Monthly Magazine*. A paragraph similar to the one in the *Cheltenham Journal* has been inserted in several other newspapers at different periods, where most likely your correspondent saw it.—I am, Sir, yours, &c., AN OBSERVER. April 4, 1833.

Sign Extraordinary.—There is a highly ingenious piece of mechanism as a sign to a well-known and long-established tavern in Kennington-lane. It consists of a colossal figure, cut out of a solid block of wood, representing a pilgrim, and weighs upwards of 3 cwt. By the aid of machinery it travels in a circular direction on the lead flat of the house at the rate of 300 feet in five minutes. The figure is so managed that its face is invariably directed to the public road. It continues its course, without any additional assistance, for a month. The figure and machinery are the work and invention of Mr. T. Lowe, artist at Vauxhall Gardens.—W. A. R.

Isometrical Perspective.—"Observer" is quite correct in stating that the engraving of Mr. Whitelaw's steam-carriage, in our last Number, is simply a projection, and not, as stated in the description, in isometrical perspective. The author probably meant "after the manner" of isometrical perspective.

LIST OF NEW PATENTS GRANTED BETWEEN THE 22D OF MARCH AND THE 22D OF APRIL, 1833.

Joshua Horton, of Taylor's Dock, Birmingham, *boiler manufacturer, for an improvement in the* manufacture of wrought iron chains, applicable to various purposes. To enrol within Six Months from the 23d March.

John Joyce, of South-row, New-road, St. Pancras, gentleman, for improvements in machinery for making nails, communicated to him by a foreigner. Six Months; March 28.

John White, of Southampton, engineer and iron-founder, for certain improvements in machinery to be worked by steam or other power, applicable to raising water and to other purposes. Six Months; March 28.

Charles Terry, of Shoe-lane, London, merchant, for improvements in producing leather from hides and skins. Six Months; March 28.

John Obadiah Newell Rutter, of Lymington, county of Southampton, wine-merchant, for an improved process for generating heat, applicable to the heating of boilers and retorts, and to other purposes for which heat is required. Six Months; March 30.

William Shilton, of Birmingham, machinist, for an improved apparatus or machine for cutting files and rasps. Six Months; April 3.

Edward Boys, jun., of Rochester, gentleman, for a machine or apparatus for preventing accidents with carriages in descending hills or in other perilous situations. Six Months; April 4.

George Rogers, of Sheffield, merchant, and John Tatam, of Hilton, county of Derby, gardener, for an improved button. Six Months; April 4.

Joseph Gibbs, of the Kent-road, Surrey, engineer, for improvements in the means, apparatus, and machinery for exhibiting scenery, paintings, or certain descriptions of pictures. Six Months; April 4.

John Ericsson, of Albany-street, Regent's-park, civil engineer, for an engine for producing motive power, whereby a greater quantity of power is obtained from a given quantity of fuel than heretofore. Six Months; April 4.

Claude Marie Hilaire Molinard, of Bury-street, St. Mary Axe, London, merchant, for certain improvements in looms or machinery for weaving fabrics, being a communication from a foreigner. Six Months; April 9.

George Washington Wildes, of Coleman-street, London, merchant, for certain improvements in machinery for cutting marble and other stones, and cutting or forming mouldings in grooves thereon. Six Months; April 15.

James Smith, jun. and Francis Smith, both of Radford, near Nottingham, mechanics, for certain improvoments in certain machinery for manufacturing lace, commonly called bobbin-net lace. Six Months; April 15.

INTERIM NOTICES.

The Supplement to Vol. XVIII., containing Title, Preface, and Index, with Portrait on steel of Professor Babbage, engraved, by permission, from an original Family Portrait, will be ready on the 1st of May; price 6d. Also Vol. XVIII. complete in boards, price 8s.

"R." is requested to send to our office on Wednesday next for an answer to his last note.

In our Magazine of the 13th inst., p. 31, for "J. W. N. Badnall" read "Richard Badnall."

Communications received from Junius Redivivus—φ μ.—Tubal Cain—Mr. G. C. Lawson—C. F. W.—Bergein.—R. R.

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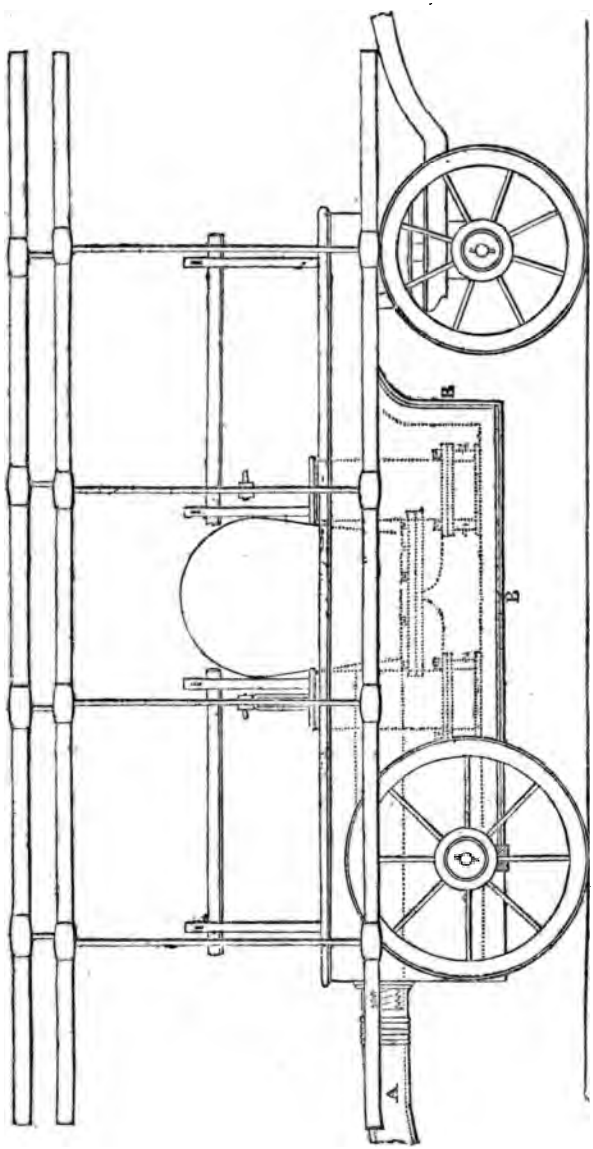
M. SALMON, Printer, Fleet-street.

Mechanics' Magazine,

USEUM, REGISTER, JOURNAL, AND GAZETTE.

. 508.] SATURDAY, MAY 4, 1833. [Price 3d.

REED'S NEW DOUBLE-POWER FIRE-ENGINE.



DESCRIPTION OF A NEW DOUBLE-POWER FIRE-ENGINE, SUITABLE FOR THEATRES, MANUFACTORIES, DISTILLERIES, BREWHOUSES, &c.; WITH SOME PARTICULARS OF THE FIRE-PREVENTION ARRANGEMENTS OF ST. PETERSBURGH.

By Mr. Wm. Reed, of the Russian Imperial Paper Manufactory, Peterhoff.

Peterhoff, near St. Petersburgh,
Jan. 3, 1833.

Dear Sir,—I send you herewith the drawings of a new double-power fire-engine which I have lately constructed, and which, from many years experience in the fire-engine line at the factories of Messrs. Phillips and Hopwood (now Tilley's), Mr. Bramah, Mr. Braithwaite, and others, I can with confidence recommend as particularly suitable to theatres, manufactories, distilleries, brewhouses, country mansions—in short, all large public and private establishments.

Fig. 1 is an elevation of the engine; fig. 2, a plan; fig. 4 a transverse section, and fig. 7 an end-view. I have drawn the whole of these figures, as well as the others hereafter referred to, with such minuteness that any intelligent workman may be able from an inspection of them to construct such an engine, without falling into any material mistake.

It will be at once seen, from inspection of these figures, that this double engine occupies very little more room than the ordinary fifth-size fire-engines. The principal difference consists in its having double handles, and four six-inch barrels instead of two. With the double handles ten men can stand in the inside and twelve outside, making a double set. The handles are 10 feet long, to give sufficient room in the down stroke. The piston works seven inches only, which enables the firemen to complete a full stroke from top to bottom without difficulty. When one of the old-fashioned long-stroke engines has been a few minutes at work, the men get winded, and able to make half strokes only, that is, they make a halt in the middle, which causes an injurious check to the flow of the water. The levers of this engine, being eight feet from outside to outside, exert more than ordinary power over the barrels or force-pumps. Each lever has a rule-joint, which is kept fast while at work by a pin attached to a short chain, as shewn at H, fig. 7; when out of work this pin is taken out, and the handles turned up, when they occupy a space of only five feet wide by five feet high.

I have allowed a good sized air-vessel (A), so that the waterways and valves may be of corresponding magnitude; for the method of wire-drawing the water, now so generally followed, is, in my firm opinion, the only reason why our modern engines do not come up to the famous Newsams of old. I may remark by the way, however, of these Newsams, that I do not believe all that is related of them; as, for example, that they could play 55 yards. If they ever played over the grasshopper of the Exchange, it must have been when it was in a situation similar to that which it temporarily occupied some seven years ago, when it lay alongside of the dragon of Bow Church in a stonemason's yard in Old-street. But to proceed:—the delivery-pipe passes in a straight line from the air-vessel A. Elbows are bad things in all hydraulic engines, and ought to be avoided as much as possible; so also are small water-cocks, and all bed-pieces of less than two inches bore, where an engine plays by suction. The delivery-hose are four inches in diameter, and run also nearly in a straight line to the branch-pipe. A ring is fixed on by two small bolts or screws, as shown at P, fig. 3, with an iron support or spike, for the purpose of resting the branch-pipe at times, and so taking the weight of it from off the hose. The bend thus given to the stream of water is so proper for the purpose, that it is projected not only far

Fig. 3.

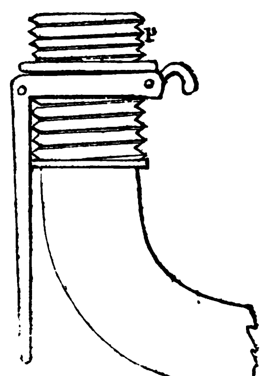
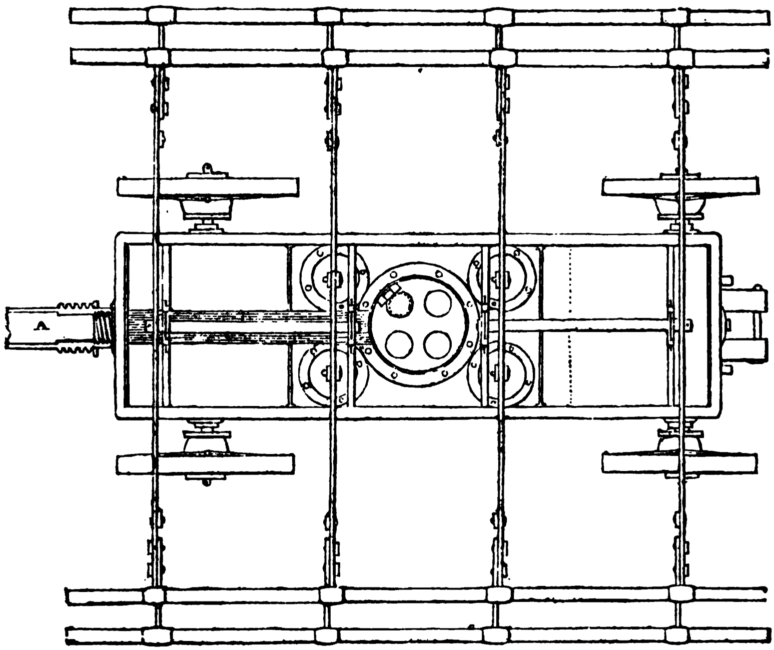


Fig. 2.



higher, but with much less labour than could otherwise be done. This hoop support has likewise a hook to assist the firemen in going up ladders, and also to rest the branch upon occasionally after he has reached his point of operation.

The supply of water for working this engine is from a cistern inside, which is filled by buckets or pails; for which purpose there is free access at each end. The barrels stand on short metal columns and foundation-plates of brass, as shown in fig. 4, and more in detail in figs. 5 and 6.

Brass hinge valves are employed, as large as the size of the barrels will admit of; care being taken that they shall open to no greater angle than one of 45°, for beyond that there is a chance of their sticking fast and stopping the plunger or piston in its descent. I think the valves of all pumps, whether for hot or cold water, should be hinge valves of brass, and not poppet-valves with spindles and

Fig. 5.

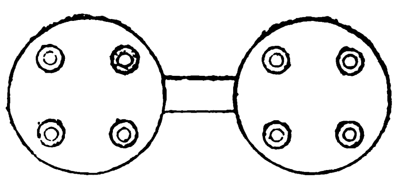
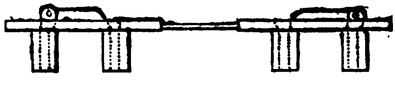


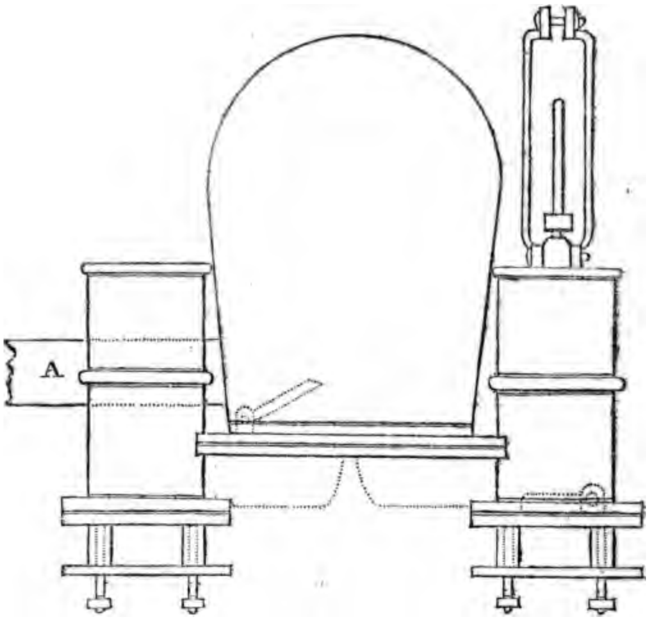
Fig. 6.



bridges, which are very liable to stick and choke the waterways.

An engine of this kind could, of course, be made to work by suction; but in places where there are no waterworks, as in many towns, and in most buildings situated remote from towns, of what use are suction-pipes? In St. Petersburgh, for instance, a supply of water can only be obtained by means of carts or buckets.

Fig. 4.



Apropos of suction-pipes, however, I would recommend that wherever they are employed they should be made of stout copper, of two or three lengths, with large easy bends or elbows, 18 inches long; that they should have coarse-threaded swivel-nuts, and be screwed on between the hind-wheels and under the engine bottom. On the upper side, and inside the reservoir, there may be a slide-valve to open from within when the suction is taken off and a cap screwed on. This will be found much better than any cock, and also cheaper. Copper suctions would, moreover, not be liable to draw air; and, if trod upon, run over, or bent, can be easily repaired, which is not the case with your leather ones with tins in them.

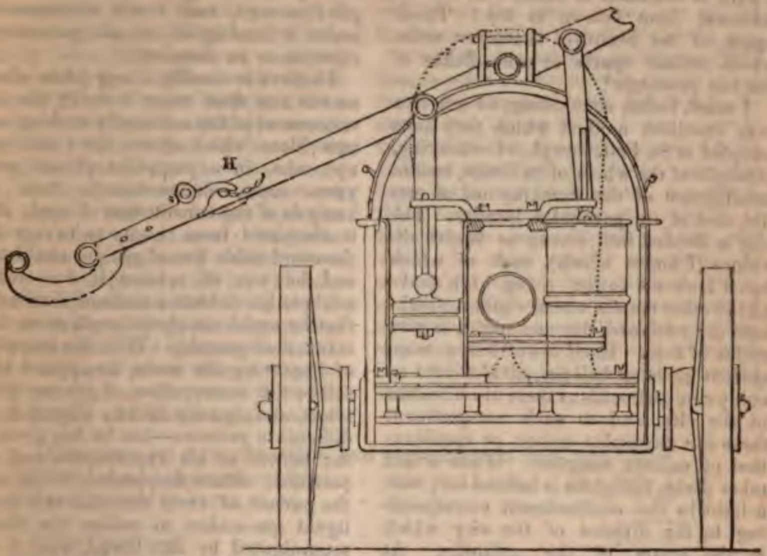
I have had for these fourteen years under my charge two of Mr. Tilley's engines—a third and a fifth size—and they are now as good and sound as ever. When the frost comes on I move them into a warm place, and keep them always fully charged with water, so as to be *constantly ready for action.* I have lads to manage them that, for skill and daring, would challenge a comparison even with your Bridewell boys of old. About six years ago, when the woods were on fire from the extraordinary heat of the weather, we were called on to assist in the extinction of the conflagration, and a rare tough job we had of it. The worst of it was, the men got so thirsty they drank the water intended to quench the fire.

I should have mentioned, in the description of my new double engine, that in consequence of its being rather lengthy between the wheels, there are two flat bars of iron placed under the bottom, as shown at BB, for the better support of the machine.

A pole to draw by seems better than shafts, as the horses can be sooner disengaged from the one than the other.

Perhaps it may not be out of place here to say a word or two about the state of St. Petersburgh in regard to its protection from fire. Were waterworks established there (as no doubt there will be in time), they would, of course, be a great

Fig. 7.



help to the fire-engine establishments; but it is to be recollected that they have, what not many capitals can boast of, a noble river, wider than the Thames at London, and several fine canals branching through the city. Now, were there but four or six floating fire-engines, like those of the London Assurance and Phœnix Companies, placed on these waters, I do not think that, as regards the matter of fire, the inhabitants of St. Petersburgh would be so very ill off. The engines, it is true, would be frozen up five months in the winter; but even then they would be able to pump up from beneath their icy barrier a supply of water for the fire-engines on shore with ten times the rapidity of persons employed with single pails at holes made in the ice. We have at present four or five steam dredging-boats for cleaning and deepening the canals. How easy would it be to have a large pump fitted to each of these for supplying water to the water-carts! The boats could be stationed in the autumn in the vicinage of those parts of the town where their assistance would be most likely to be required. The engines are (I believe) of about twelve horse power, and in hard frost the boiler ought, of course, to be empty; *but six or seven men would by a hand-pump fill the* boiler while the fire was lighting, so that the engine could be at work within an hour. Were the people of St. Petersburgh to have one of Mr. Braithwaite's steam fire-engines (I hear they have got one at Berlin), it would not be of much more use to them, under existing circumstances, than one of these steam dredging machines. For who would dream of supplying by pailfuls an engine which discharged a ton of water per minute? Such an engine can only be worked to good purpose where there is an ample supply of water laid on, as in London, to every individual house. I will not say that such an engine might not, nevertheless, be very desirable in this capital; for, during the winter, it could be run upon the ice *at any part* nearest to a fire on the banks, and on a hole being made in the ice (which, as the ice is rarely above two inches thick, would be a work of not many minutes,) it could supply other fire engines with water, if it could not itself perform the work of one; while the steam dredging boats, from being wedged up in the ice, could only be of use under particular local circumstances. St. Petersburgh, though without water-works, has after all, many things in which she is much superior to London. Think only of the thick walls of her dwelling-

houses, constructed of 2½ inch bricks, and a yard in thickness or more, with a stone staircase from bottom to top! Think again of her beautiful sheet-iron roofs, which neither sparks or even flakes of fire can penetrate!

I must, before concluding, advert to a very excellent method which they have adopted in St. Petersburgh, of conveying, throughout the whole of its limits, instant intelligence of the breaking out of any fire, and of its particular locality. The city is divided into eleven or twelve divisions (I forget which), each of which has a look-out tower, rising high above all the other houses, where vigilant watchmen are stationed, day and night, to give notice of fires. Each tower has a transparent globe or balloon, divided into as many compartments as there are divisions in the city, and to each compartment there is a particular colour or combination of colours assigned. When a fire takes place, this globe is hoisted out, with a light in the compartment corresponding to the division of the city which is the scene of the calamity. At each of these watch towers, too, there are fire engines, firemen, horses, ladders, water-carts, &c., in constant readiness, and all in capital working order.

I remain, dear Sir,

Yours truly,

William Reed.

GAS-LIGHTING. — COMPARATIVE ADVANTAGES OF COKE OVENS AND FURNACES.

Sir,—I am very doubtful whether anything I can say in continuation of my former communication will be deemed worthy of insertion, after Mr. Rutter's manly and pithy reply to his antagonist "C." There is, however, one department of the inquiry at which Mr. Rutter has briefly glanced, but which, with all due respect to so intelligent a writer, was I think worthy of more extended investigation, and upon this point I will venture a few remarks.

I gather from "C.'s" letter that the grand secret of "his plan" is an indiscriminate use of coke ovens, applied to heating the retorts ordinarily employed for the distillation of gas. Mr. Rutter recommends furnaces, in which, I presume, he consumes a portion of the coke made in the retorts. To detect the fallacy of "C.'s" doctrine, it will be needful to enter rather minutely into my views of the theory of the distillation of gas from coal, and I will endeavour to make it intelligible to all gas-makers, chemists or no chemists.

I believe it was Mr. Clegg (than whom no one has done more towards the advancement of the science by striking out new ideas which others have followed up), who, in a pamphlet printed some years since, demonstrated, from an analysis of the constitution of coal, that it contained from twenty to twenty-five thousand cubic feet of gas per chaldron; and he was of opinion it was owing solely to his defective mode of distillation that he could not obtain much more than HALF that quantity. With the intention of improving the mode, he applied himself to the construction of his revolving retort, and signally failed; why, it is not difficult to perceive—but he has given us the benefit of his experiments and experience. Since that period, it has been the pursuit of every scientific and intelligent gas-maker to realise the theory promulgated by Mr. Clegg, and I understand it is one of the objects Mr. George Lowe has endeavoured to accomplish in his new patent reciprocating retort.

I must candidly confess that I have not had the benefit of personally experimenting upon very many of the numerous descriptions of retorts, or their varied modes of setting; and *that*, for a very good reason—I cannot afford it. I have, however, in the course of my little experience, seen (as Mr. Rutter justly observes) "much that is absurd, and stands opposed to the fundamental principles of science," and have endeavoured to steer clear of such. I have steadily kept in view Mr. Clegg's theory, and, as far as my opportunities would allow, made it my aim to realise it. I think I can perceive Mr. Rutter has the same ideas: he has put the question to himself—what are the obstacles which prevent me from extracting as gas all the hydrogen and carbon I know to be in the coal? My reply is, that the heat we ordinarily apply is insufficient to decompose the vapours arising from the coal during distillation. Heat—constant, uniform, equal heat—is everything. When my heats are good, and my charges light, I can extract all the gas worth having in a very short time; let my heat decrease and my

charge is ruined: if the gas does not come over in the first two hours, it will never come, for it has already passed off as tar and ammoniacal liquor. And here a deadly blow falls upon an exploded system, which has again found an advocate in "C." I grant he might, if he chose, melt his retorts—that proves nothing; but I deny that he can keep them during the twenty-four hours at a constant, uniform, and certain temperature. I will suppose that he charges his oven once in twenty-four hours: why, the whole mass is instantly cooled down almost to blackness, and it will take twelve to fifteen hours before it arrives at even a moderately good temperature. And during this time what are the retorts doing? Almost worse than nothing—giving out gas at the rate of 8000 feet per chaldron, and hastening to destruction by the immense variation in temperature. Let "C" deny this if he can, and name the place where the system has been attended with other results.

I will, for the sake of proving to "C" that in point of expense his system is not invariably attended with the results he anticipates, quote what I am given to understand are the workings of six retorts, set upon each principle, in a large town in the west of England, but where their furnace workings are *capable* of considerable improvement. I do not vouch for their *minute* accuracy, for among gas-makers there exists a system of petty exclusiveness and jealousy, mixed up with an air of mystery, which prevents any certain information being obtained, but I believe the following to be near the truth:—

Six retorts set over coke ovens, and worked for six days, consumed

162 cwt. of coal in retorts, at 5*d*. - - - - -		£3 7 6
270 cwt. of coal in ovens, at 5*d*. - - - - -		5 12 6
And produced		£9 0 0
270 bushels of retort coke, at 2*d*. - -	£2 5 0	
450 bushels of oven coke, at 2½*d*. - -	4 13 9	
		6 18 9
		£2 1 3

The gas produced was 60,000 feet. The cost of coal and fuel was therefore 8½*d*. per M. feet.

Six retorts (same as above) set over furnaces, and worked for six days, consumed

144 cwt. of coal in retorts, at 5*d*. - - - - -	£3 0 0
60 bushels of coke as fuel, at 2*d*. - - - - -	0 10 0
And produced	3 10 0
240 bushels of coke, at 2*d*. - - - - - -	2 0 0
	£1 10 0

The gas made was 75,000 feet. The cost of coal and fuel was therefore, in this case, about 4¾*d*. per M. feet. I willingly resign to "C" all the honours and advantages he can acquire from such an exposition of his system.

"C" imagines that his views on this subject are novel, and have not received the attention they deserve. I happen to have in my possession an old memorandum book, belonging to a "gas engineer" of some standing, containing the following note of an experiment performed upon a coke oven, April 10, 1822:—

	cwt.	qrs.	lbs.		*s.*	*d.*		£. *s.* *d.*
Pembrey coal,	16	0	18	at	1	2	- - -	0 15 2
Produced								
Good coke,	8	0	0	at	2	3	- -	0 18 0
Breeze,	0	2	14				-	0 0 2
								0 18 2

This shews a profit of 3*s*. upon the day's operations. Now, I think this is equal to anything of which "C" can boast; but even *this* was abandoned, in consequence of the impracticability of selling the coke, and this is my other fatal objection to the indiscriminate use of ovens. I believe that at Maidstone, Canterbury, and some other half dozen towns in the kingdom, the system is still pursued with advantage. The large quantity of coke annually required in those districts for drying hops allows of its being carried on to the fullest extent, and a remunerating price being maintained; but I know the best *they* can do is to cover the original price of their coal. "C" must not take for granted, that because he can sell in a small town the coke produced from one retort and oven, that he can do so on the *large* scale. Perhaps he is only supplying forty or fifty private lamps—how would he be with twenty additional public lamps upon him? His produce of coke would be fourfold, and it is not a *single* foundry and *two or three* malt kilns that can *then* consume it: he would find his market overstocked, must reduce his price to force its sale (consequently reducing the value of the system), and, finally, have recourse to furnaces as the most economical in practice. This is not speculation only: I can name a score of gas works whose misfortune it has been to have had to pass through all these stages, and, if I am not much mistaken, one with which "C" has been intimately connected.

One word more at parting. "C" says "coal that will not yield 8,000 feet per ton should not be used in gas works." I think the ideas I have broached on this subject will be new to "C." As some evidence of the soundness of my views I will conclude with a statement of the results of an experiment I witnessed a few days since, upon the products of one chaldron (weighing 2,880 lbs.), of Lambton's Primrose coal:—

	lbs.
15,000 cubic feet of gas, specific gravity 45 - - -	632
57 bushels of coke - - - - - -	1881
Tar and ammoniacal liquor - - - - -	180
Loss - - - - - - -	187
	2880

The loss I can readily account for, as the deposits in the washer, purifier, &c., were not taken into the calculation. But is it not palpable that five to six thousand feet of gas was *lost* in the operation? If our mode of distillation were *perfect*, we should not allow 180 lbs. of tar and ammoniacal liquor to be driven off; and the improvement of this department of our labours presents a most extended field for laudable and honourable exertion. I again repeat, heat is every thing to us: if the temperature is lowered, we drive off little gas and much vapour, which is deposited as tar, &c., but if raised, we decompose that vapour as generated, and take it off as gas. Mr. Rutter's distinction between gas and condensible vapour is judicious and appropriate.

I may at some future period offer a few more opinions on this subject to your notice; at present I think enough has been said to awaken and stimulate inquiry amongst my fellow-labourers.

A Gas-maker.

April, 24, 1833.

THE UNDULATING RAILWAY.

Sir,—Your correspondents, Messrs. Badnall and Cheverton, have fallen on me tooth and nail, on the subject of my letter respecting the *undulating railway*, but neither of them seems to have accurately read the letter in question, and consequently, without taking into consideration the fact of the very bare data on which I wrote, they pleasantly enough assume that I ought to have taken another ground of attack. All that I knew of the railway was from a casual hearing that there had appeared a paragraph in the "omnium gatherum" of the "leading journal," stating that an undulating railway had been invented, whose effect would be utterly to destroy all level railways by its superior utility. The *Athenæum* I have not seen. Feeling interested in the matter,

I caused enquiries to be made at the Adelaide Gallery, but lo! the carriage had disappeared, and the inventor had retired to "Brummagem." Inquiry was made for a prospectus, and reference was given to Messrs. Sherwood, Gilbert, and Piper. Application was made to that firm, and the reply was, that nothing was known of it. Now what inference could be drawn, under these circumstances, but that the whole thing was a gull? I therefore assumed that the object of the undulating railway was to increase power or diminish friction, in short, to make a given amount of power do more work. Upon this assumption I reasoned, and I have reason to know that the reasoning was to the satisfaction of many persons besides yourself, though Messrs. Badnall and Cheverton are not satisfied. I certainly do not purpose entering into the abstruse calculations the former gentleman adverts to in his two questions, and for which I have neither leisure nor inclination. I shall only state generally, that even supposing the total amount of friction to be the same, on the curve and on the level, the accumulation of friction which will take place upon one-half of the ascent, will rack and rapidly destroy either the engine or horses from which the power may be obtained. Neither shall I attempt to calculate the difference of the velocity on the curve and on the horizontal line, but content myself with remarking, that it is only by an increase of power that an increase of speed can be obtained. Does Mr. Badnall purpose using fixed engines on the summit levels to draw the carriages up the ascending curves? Before he puts upon me the onus of setting forth his fallacy, it would be but fair that he should give your readers an opportunity of knowing what it is that he really proposes to do, and wherein the advantage consists of the undulating surface over the level. I have taken some pains to acquire the information, but have not succeeded. You have been in the same predicament, and have evidently drawn the same conclusions as myself. Mr. Badnall seems sore with me: I regret it; I did not wish to hurt his feelings. I spoke of the railway, not with reference to persons, but to things. And my incredulity may certainly be excused, when it is considered that want of sufficient explanation, on the part of Mr. Badnall, has left me as well as others in the dark. I really should not be the last to hail with joy such a triumph of mind over matter as Mr. B. proposes, but I should like first to see it fairly made out beyond dispute.

Mr. Cheverton begins his letter by deprecating any intention of giving offence. It was needless—I am but a shadow, and as void of taking, as of intentionally giving offence, having no object in putting forth my ideas, such as they are, save the eliciting of truth, by which result I as well as others may hope to benefit. I say to all, strike and spare not, and, whenever culpable, I will bow to the chastening rod. Had I been an offence-taker, Mr. C. has certainly hit upon the best mode of provoking it. He calls me a "clever writer." I had rather he called me a fool, since the latter may be an honest man, whereas the former commonly means a man who can argue like the "lawyer" Mr. C. alludes to, on any side of a question, without caring for the truth. I may be an "unpractised thinker," of which allegation I leave your readers to judge, but I assuredly am not "a writer," in the literary meaning of the term; and as for "cleverness," I should be sorry to have it proven upon me, as being the direct opposite to either wisdom or honesty.

With regard to the general effect of the railway in question, Mr. C. seems to hold the same incredulity as myself, though he would seem to know something more of the details than I do. How he came by his knowledge I cannot divine, inasmuch as he says, specifically, "I cannot enter upon this point, as I have not investigated nor even seen the experiments." Taking this acknowledgment into consideration, he would seem to speak with over confidence as to the "*facts*" of the experiments. I will not say, with his friend the engineer, that "though I should see it I would not believe it," but were I to see it, I should be suspicious of a trick in the first instance, and in the next, when satisfied that the thing were actually a fact, I should be disposed to think that the age of miracles had returned, and that the laws of nature were in one especial instance subverted. Mr. C. would seem to be rather "superficial," in expecting me to reason without data, and that I had no more data than your-

self to go upon, I have already set forth. I could not set forth a fallacy, which had not been presented to me for examination.

With regard to the scheme of locomotion from summit to summit, by means of the pendulum, I shall not reason upon it as a mathematical proposition, but as a practical matter. A carriage, say of one ton weight, exclusive of wheels and axles, will require a certain power to draw it along a given level. This carriage would be upon four axles of the smallest diameter consistent with security. If it were taken off the four axles, and slung upon one axle, it would be found in practice that the single axle would require to possess four times the strength of each of the four, and the friction upon the increased diameter would consequently be in the same proportion. More than this, the suspending bars would be no slight addition to the total weight, and something extra must be allowed to the single axle on that account. Therefore, taking into consideration the friction of the axle, slow though the motion be round the axle, the resistance of the air, the power required to move the carriage along the "short roads," the hanging and unhanging, the increased distance between the curve and the level, and the extra weight, I should say at once that the process would be less economical than that of the four-wheeled carriage on the level. There is no need of mathematical calculation to come to this result, and I cannot conceive the use of propounding abstruse mathematical calculation in a matter which, it is self-evident, can turn to no useful account. Mr. Cheverton will not set about pendulum locomotion in earnest, when he takes into consideration the expense of the lofty pillars required for the points of suspension, for the world is not yet ridged up into equal distances like a ploughed field. As for "the terms of the proposition that all hindrance is provided against," it is nothing more than a proposition that all friction shall be voted a bore; but so long as the bore continues to exist, so long will the pendulum locomotion remain an unprofitable speculation. When it shall be overcome, the only difficulty will be to chain up locomotive machines, to prevent them from doing damage by the exercise of their ruling passion—to move. Mr. C. asks me to shew "how and where the diminution of friction at any place or places along the curve would be compensated by an excess of friction in others." The exact "where," I shall not attempt to shew; that it is so, I will endeavour to illustrate in a familiar manner. Let Mr. C. take a common carpenter's saw from the mould-loft, and screw it in a vice with the edge uppermost, parallel to the horizon; then let him traverse a roller along it in both directions, and he will find that the amount of friction will be considerably more from point to heel than from heel to point. The reason of this probably is, though I do not pronounce confidently, that the elasticity, both of the roller and the saw, exerts a greater force to overcome the friction in the latter case than in the former. The opposing points, in the former case, deaden the elasticity, and leave the friction to exert its whole force. Now, in running a carriage down hill, there is a very considerable quantity of elasticity brought into play; in some cases the friction is nearly all removed by the carriage actually bounding in the air, a fact, which as I have before remarked, caused, as I have been informed, the application of steel springs to coal-waggons. But after the carriage has descended with the velocity increased by the elasticity, it serves to impinge it with the greater force against the opposing points of the ascending curve, and the momentum is accordingly expended more rapidly than it was accumulated. As the ascent increases the friction increases also, and it is aided by the centre of gravity increasing its distance *behind* the point of contact. To state the matter shortly, the carriage runs down hill because the centre of gravity is *before* the points of contact; it will not run up hill, because the centre of gravity is *behind* the point of contact; and the elasticity which aids the downward momentum is absorbed on the ascent, in a ratio quicker than that of its generation, while no fresh elasticity can be generated, for the carriage in its ascent adheres closely to the track on which it moves. How Mr. Badnall purposes to apply his moving power I know not, but I apprehend that a steam-engine is not by any means improved by going at a very irregular pace; going down hill scarcely any power would be needed—going up hill as

enormous power would be needed; and that horses are not the better for being unequally worked, was sufficiently proved by the fact of the large expenditure of capital on the Highgate Archway.

Mr. Cheverton thinks it marvellous that carriage-builders should not be aware of the fact, that "a plate of iron was stiffer placed on its edge than when laid flat." Whether they are aware of the fact or not I do not pretend to pronounce. That it *is* a fact that some of them use their plates in an unscientific manner he cannot doubt, when two of the guild, "Phæton," and "A Carriage-maker," have held differing opinions on it in the pages of your Magazine. Mr. C. is witty on my proposition to ballast carriages as ships are ballasted, yet wherein it is ridiculous I am at a loss to divine. He would scarcely propose to save weight in the use of the ship, by omitting the ballast altogether. This would be like the ape in the story, who

> "To try conclusions, in the basket crept,
> "And broke his own neck down."

In the case of the carriage, the proposition was not the saving of weight, but the adjustment of the springs to the necessary tension for either one or more persons, and solely with a view to the greatest comfort of the riders. If it were merely desired to save weight, the springs should have been altogether omitted. If it be desired to procure the most perfect state of elasticity, conducing to the comfort of the riders, I should feel obliged if Mr. C. would point out any better mode than the one I have proposed. The better to illustrate what he has conceived the absurdity of my proposition, Mr. C. has introduced the story of the Spanish mule; but it has proved a failure, and has served to evidence two things against himself: first, that he has not studied the philosophy of mule loading; and, next, that he is guilty of the "unpractised thinking" with which he charges me. Had the spirit of Mr. C. ever inhabited the body of a mule, after the fashion of the transmigration doctrine, or had he served any time as an *arriero*, he would know that the most essential thing to the orderly travelling of a loaded mule is, that the cargo should be as nearly equal in *weight* and *bulk* as possible, on either side the pack-saddle. A good mule will carry four hundred pounds weight, two hundred on a side. Now, were two hundred and fifty placed on one side, and two hundred on the other, and the mule could speak, like Balaam's ass, he or she would say to Mr. Cheverton, supposing him to be the muleteer, "Be so good as either to take away the odd fifty from my right side, or if that cannot be done, as the next best thing add another fifty to the left side, because the heat of the pack-saddle and the cloths beneath it has stewed my hide almost to a jelly, and the unequal strain across my back-bone will burst it when the cargo begins to jolt." Now, with an inanimate cargo there is sometimes a chance of reduction; but as Mr. C. laughs at the muleteer's plan in the case of the live cargo, he is bound to shew what better plan he would have adopted, or forfeit his reputation as an engineer skilful in resources. Would he have eschewed the "load of stones," and then have gravely purposed to pare away the superfluous weight from the biggest traveller, after the Procrustean recipe? I suspect that the Andulusian knife, or the four-square blade of the *matador*, would have been brought forward in arrest of judgment. There is a saying amongst the mountain muleteers of some parts of Southern America, *La mula sabe raciocinar mejor que algunos Christianos.**

With regard to the repeating air-gun I proposed, Mr. C. has taken "an incomplete and superficial view" of my letter. If he reads it again, he may discover that there was no proposition therein to "multiply power by complication," but simply the substitution of compressed air, which would not destroy the gun, instead of the steam and intense fire which does destroy the gun. The power is to be communicated to the air by means of the steam, because the steam itself cannot well be applied. *Voilà tout!* Really Mr. C. would seem to be an "unpractised thinker." Ere he so triumphantly quoted my words, to the intent of my "mere confuion," as *Cloten* says in the play, it surely would have been but a very small portion of wisdom to endeavour to understand the tendency of the air-gun letter, notwithstanding the obscurity of my mode of writing.

Mr. C., at the conclusion of his letter, again hopes that his "observations will be taken in good part." They are so,

* The mule knows how to reason better than some Christians.

and replied to in the same spirit, and I have to thank him in addition for having thus given me an opportunity to explain myself more fully.

I am, Sir, yours, &c.
JUNIUS REDIVIVUS.

April 22, 1833.

SOLUTIONS OF THE 7TH OF THE MATHEMATICAL QUESTIONS, last vol. p. 155.

Question.—Demonstrate from G. S.'s figure (Mech. Mag. July 23, 1831, p. 333), that sin. $(A+B)$. Sin. $B +$ cos. $(A+B)$ cos. $B =$ cos. A.

By a Westminster Scholar.

Referring to G. S.'s figure: assume $RC = A$, $EC = B$. Then, AD, DE, CG, ($=$FD), EF, AF, are sin. $(A+B)$ cos. $(A+B)$, cos. A, sin. B and cos. B respectively; and since AD EF is a quadralateral merged in a circle $\therefore AD{\cdot}EF + DE{\cdot}AF = AE{\cdot}CD$; and assuming $AE = 1$: sin. $(A+B)$, sin, $B +$ cos. $(A+B)$. Cos. $B =$ cos. A.—Q. E. D.

Otherwise by Cargil.

By a well known theorem, sin. $(A+B)$ $=$ sin. A. Cos. $B +$ cos. A. Sin. B $\therefore$ sin. $(A+B)$. Sin. $B =$ sin. A. Cos. B. Sin. $B +$ sin. ^{2}B. Cos. A. And from another established theorem, cos. $(A+B)$ $=$ cos. A. Cos. B $-$ sin. A, sin. B. Consequently, cos. $(A+B)$. cos. $B =$ cos. A, cos. ^{2}B $-$ sin. A, sin. B, cos. B. Hence, by addition, we have sin. $(A+B)$, sin. $B +$ cos. $(A+B)$. Cos. $B =$ cos. A.

MR. HANCOCK'S STEAM-OMNIBUS.

Sir,—More than six years have elapsed since I began my experiments on steam locomotion; and I have followed it with an ardour that did not admit of any diversion from the grand object which I kept steadily in view. During the past week I have exhibited daily on the Paddington road a steam-omnibus, the result of my experience; and having hitherto carefully steered clear both of extravagant anticipations and exaggerated statements, I should be sorry now if any such should find their way into the public prints. In order to prevent this, as far as I am able, I beg to hand you for insertion in your wide-spreading miscellany the following results of the first six days:—

April 22.—Started from Cottage-lane, City road, to Paddington, and from Paddington to London Wall, and back to Cottage lane—9½ to 10 miles; 1 hour, 8 minutes. Delays, 18 minutes; travelling, 50 minutes.

—— 23.—From Cottage-lane to Paddington, and back to Cottage-lane — 8½ miles; 1 hour, 11 minutes. Delays, 9 minutes; travelling, 62 minutes.

—— 24.—Same ground—1 hour, 4 minutes. Delays, 11½ minutes; travelling, 53 minutes.

—— 25.—Same ground and back as far as St. James's Chapel; piston broke.

—— 26.—Same ground and back to Cottage-lane—49 minutes. Delays, 5 minutes; travelling, 44 minutes.

—— 27.—Same ground—50 minutes. Delays, 5½ minutes; travelling, 44½ minutes.

Average quantity of coke, 1 sack to each trip.

It is not intended to run this carriage more than about a week longer; partly because it was only intended as a demonstration of its efficiency, and partly because my own occupations will not admit of my personal attention to the steering, which I have hitherto performed myself, having no other person at present to whose guidance I could with propriety entrust it. During the time that it will require to build two more carriages for the Paddington Company, I shall have one or two others of my own running, which will afford me an opportunity for training steersmen, &c., for this road, which, of all others I am acquainted with, requires the greatest steadiness and attention.

I am, Sir, your obedient servant,
W. HANCOCK.

Stratford, May 1, 1833.

N. B.—I would just observe, that your correspondent "Candidus" has, I think, stated the number of journeys rather too high. From the manner also of wording his letter it would almost seem to imply that the "Enterprise" was built in the City-road, and that other carriages were in progress of building there; but I have

no establishment in London, and the "Enterprise" was built at my own place at Stratford, and had its first trials on that road. I took it to town merely to avail myself of the assistance of London artists in its decoration, &c., after which, and before its delivery, I ran it over its intended road, &c., as stated by "Candidus." Thus much for steering clear of all mistakes.

ROAD-LABOURERS' COTTAGES AND GARDENS.

Sir,—I have not the advantage of having read Sir Richard Phillips's writings. The writings of your correspondent, "Junius Redivivus," suggested to me, as I have already stated, my suggestions (M. M., March 10, and April 28, 1832) for cottages and gardens for the road-labourers throughout the British empire. To the plans of Mr. Loudon, "Caballais," and Mr. Saul, of Lancaster, Sir Richard Phillips can have no claim. Those plans were published in this journal. I have not the slightest pecuniary interest in the question, which has been (I believe) submitted by the Duke of Richmond to the Committee of the House of Peers on the Turnpike Roads.

In 1826 I neither saw nor heard of mile-houses, from Calais to Perpignan. In the early part of 1828 there was not one mile-house in the Landes, on the road between Bayonne and Bordeaux, which was suggested by Buonaparte in 1808. There were post-houses in France, posadas in Spain, caravansaries in the East, before the Emperor thought of constructing the Simplon, which is not in France. As Mr. Arthur Young most ingeniously stated, France is divided into three agricultural departments. In France the roads are ornamented with trees,—the apple and pear in the corn country of the north; the peach, plum, and cherry, in the wine country of the Midi; the mulberry and olive in the silk, and oil, and maize country of the south. The French peasants, being good-natured, are naturally polite. The girls, being spinsters, bring to their husbands an ample supply of linen. The question is, in what part of France shall we find the *model* cottages and gardens? Sir, in justice to your correspondents, who have directed the attention of the public to this important national plan, I have to request you will call for the immediate production of the suggestions alluded to by "An Observer," in your publication of to-day.

I am, Sir,

Your very obedient servant,

T.

April 27, 1833.

EFFECTS OF BURYING IRON AND STEEL IN THE EARTH.

Sir,—I very much doubt whether we possess sufficient information to warrant the conclusion, that burying iron and steel in the earth "causes a decided improvement in its quality."

It is a subject that well deserves minute investigation. I think, however, it belongs to the practical worker in these metals, rather than the experimental chemist, to make the necessary observations. The chemist may be able to analyse a piece of metal, and to ascertain with tolerable accuracy of what materials it is composed*; but he will give very little useful information as to its utility, unless he be assisted by the experience of the man who forges, and tempers, and sharpens the specimen, and thus exemplifies its peculiar properties.

That chemical changes are constantly going on in the vast and magnificent laboratory of nature, cannot, as I conceive, be denied. We must, however, bear in mind, that the chemistry of nature, seems evidently designed to prepare materials for the chemistry of art to operate upon, and not to supersede the art itself.

The pile-shoes of London Bridge ought not to be cited as illustrative of a beneficial change by simply burying them in the earth. When those pile-shoes were forged, iron was a comparatively scarce metal. The small quantities of ore that were smelted in that day, imply a careful and protracted process, evidently conducted under a variety of disadvantages as respects quantity, yet involving, perhaps, some of the most favourable conditions relative to quality.

The superiority of the straps that were in immediate contact with the charred surfaces of the piles, seems to indicate a

* The chemist who can do this, must be more expert than a "Lecturer on Chemistry," of whose performances in the analytical way I have lately heard an amusing account.

process somewhat analogous to the cementation of iron in forming it into steel, by its combination with carbon. Yet, after all, may not this part of the shoe be that which had retained its original peculiarity, whilst that not in contact with the charred surfaces had become deteriorated by the soil in which it was imbedded?

It is to be feared that pratical men, in the various departments of science to which they belong, are not sufficiently attentive to the phenomena that are constantly inviting their observation. Those of them who possess discernment enough to distinguish between things that differ, generally keep their own secrets. They are fully justified in doing so, whilst the present system of plundering and appropriating prevails in the scientific world. There is no very great encouragement for a poor man to communicate what he knows, merely to see others enriching themselves by the results of his unacknowledged, unappreciated, and unrewarded labours.

Your valuable correspondent "Junius," p. 7, present volume, has said more of me than I deserve: were my means proportionate to my wishes, and I trust they are not immoderate, I should, perhaps, do more than I can at present. A young family, and a tolerably extensive business, justly demand of me the greater portion of my time and attention. A few moments of occasional leisure are all that I can spare to science; but those few moments always leave behind them a reward more satisfying and more enduring than either wealth or honour can confer.—I am, &c.

J. O. N. Rutter.

April 30, 1833.

THE MIDLAND COUNTIES RAILWAY, AND CROMFORD AND HIGH PEAK RAILWAY.

Sir,—In your Magazine for March last, under the head "Midland Counties Railway," there are some remarks made by a correspondent who subscribes himself "Candidus," which, if permitted to pass unnoticed, might probably, in some measure, have their *intended effect* on the public mind. I am not so apprehensive on the one hand, or so vain on the other, as to suppose that what either "Candidus" or myself may please to say of *railways will influence* public opinion, by which alone they must stand or fall; but as such unfounded assertions are in some degree calculated to prejudice the minds of those who may be "halting between two opinions," and to give a momentary check to others, who, having considered the subject, have arrived at a correct conclusion, a few remarks tending to place them in a proper light may not be unacceptable.

I have been favoured with a copy of the report published by the Committee of the Midland Counties Railway; and must say, that your correspondent's *fears* as to "confiding people" being led into "error," or "ruin," appear to be quite groundless. It contains a very fair and candid statement of the nature and expense of the work, which is guaranteed to be completed at the published estimate, and is interspersed with calculations of the cost of conveyance, founded on data derived from actual experience on other railways. So that, unless your correspondent's "confiding people," like "foolish curs, run winking into" "error" and "ruin," they may see what they are about, without the assistance of Candidus, Self, & Co.

"Candidus" says that on the Liverpool and Manchester Railway, instead of 624,000 tons of goods, only about 86,000 tons have been conveyed along it during the half year ending 31st Dec. 1832; but are we to infer from this, that because the estimated quantity of goods has not been conveyed during the first two years, that it will not or cannot reach that quantity? Surely not: all the world knows that the Directors have their hands full, or nearly so, with passengers alone at present. "Candidus" knows that passengers pay for carrying much better than goods; and any one knows that people having their choice of two good things usually take the best, as, in choosing between two evils, they generally choose the least. What inducement, then, can the Directors of the Manchester and Liverpool Railway have to struggle with the canal proprietors, for that which they can do exceedingly well without? "Candidus" remarks, that sugars and other articles are often warehoused, and remain not only days and weeks, but "months after arrival," and hence jumps to the "luminous" conclusion, that "goods do not require a rapid conveyance." I cannot think that even "Candidus" can feel

satisfied with this view of the case, as he must know that immense quantities of merchandise are carried by such conveyance as fly-boats, fly-vans, coaches, &c., at a considerable extra expense; proving at once, if any proof were necessary, that many descriptions of goods *do* require a rapid conveyance, and that, in commercial transactions, time is of the greatest importance.

We now come to some remarks made by "Candidus," on the Cromford and High Peak Railway, in which, from living in the neighbourhood, I feel rather more interest than in the other parts of his communication. "Candidus" says' that "the Cromford and High Peak Railway cost £160,000:" true—"was to pay 11 per cent. on £150,000:" very true—"has since been completed, and has not paid one farthing to the subscribers:" most true—and when he "saw it in July last was not doing business enough to pay the ordinary expenses of working it:" most false, or I am wrong informed. It so happens (and I speak from good authority), that in and long previous to July last the business was sufficient to pay, not only ordinary but extraordinary working expenses; and subsequent to July last, the income has been considerably more than sufficient for that purpose, and that, too, under circumstances which necessarily cause the working expenses to be at the outset nearly at a maximum. As regards the first part of the statement of Candidus, "the alluring eleven per cent." I can only say, "hope tells a flattering tale," notwithstanding which, I must confess the concern stands in a most singular and unfortunate predicament, *for no one, I presume, ever before heard of a public work which failed in paying a handsome dividend the first half year.*

Now, Mr. Editor, I think after reading these statements, *which are facts*, it behoves you not to encourage "mere speculative opinions, which may answer *certain persons*' purposes, but must ultimately lead into error confiding persons" who may read them.

I am, Sir,

Yours, very respectfully,

PEVERIL.

Wirksworth, April 23, 1833.

EFFECT OF THE TEMPERATURE OF BEE-HIVES ON THE QUALITY OF THE HONEY.

Sir,—Notwithstanding the adequate justice which Mr. Nutt's improved and admirable system of bee management has received at your hands, there is one point which does not seem to have elicited much of your notice—the superiority in quality both of the honey and wax. It does not appear to me that the whole of the superiority consists in freedom from extraneous animal or vegetable matters, but that it principally depends upon the low degree of temperature at which the bees effect their labours, and which is not sufficient to produce any chemical changes in the constitution of these substances; whereas under the old system the continued high temperature of the hive is sufficient to induce those changes which impart the colour that so materially deteriorates the quality as well as the value of the products.

In this view of the change of colour, induced by the application of excessive temperatures, I am supported in the collateral instance of the superiority of the sugar produced by Mr. Oaks' improved mode of operation, as practised in Demerara, as well as in various other substances in which the combining elements are sustained by a low force of affinity. To me, the phenomena of charring or colouring in these cases appears to be the partial decomposition of the substances, the union of the oxygen and hydrogen, and the formation of water, which is either absorbed by the remaining part or dissipated by evaporation and the precipitation of the carbon, which, in different proportions, affords the different degrees of opacity or colour.

But there are cases in which the application of temperature effects changes more important in the chemical constitution of substances, particularly when their utility as medicinal agents are taken into consideration. Such are those attendant upon the preparation of vegetable extracts. In many of these cases the proximate elements of the substances enter into fresh combinations, producing compounds differing materially from those which exist in the recent substance. The extract of bark, as usually prepared, contains a very large portion of insoluble precipitate: this I find to be a combination of tannin and starch, with a portion

of cinchonin: the two farina, although not combining under ordinary circumstances, yet enter into union, forming an insoluble compound when much heat is applied.

The chemistry of nature is a most extensive field for investigation, consisting, as the changes do, of operations rarely appreciable in the laboratory, and better defined by analogy than by texts; yet where we can trace her in the simplicity of her operations, by following her steps, we can rarely err in the progress to perfection. In the superiority of the iron, exposed under the circumstances stated in your journal, unless changes more recondite than any now known to the chemist takes place, it is possible that it is only in the simple affinity of iron for carbon that the important effect is produced. But it is not necessary to speculate upon a point which may be decided by chemical investigation, should further opportunity, or the liberal spirit of Mr. Weiss, afford the examination.

I am, Sir,
Your obedient servant,
ABRAHAM BOOTH.

April, 13, 1833.

Packing Machinery.—Sir, I think I can add a trifle to the "Hints for Packing up Machinery, &c." as published in your work of March 16. Let the grease intended to be used be first subjected to a heat of about 230° Fahrenheit for about an hour, to evaporate its watery particles; then mix therewith a good portion of fresh-burned charcoal, reduced to an impalpable powder. I calculate that, when goods are so packed, they will be preserved from rust for a pretty considerable long time.—I am, yours, &c., JONATHAN.

Novel Mode of Gas-Lighting.—Mr. Loudon, in a recent Part of his *Encyclopædia of Cottage, Farm, and Villa Architecture*, in describing a design for an Italian villa, observes:—"This villa should be lighted with gas, by burners placed outside the windows, with parabolic reflectors, as has been done in some places in England. The exterior effect in a dark night, I am informed, is magnificent beyond description. By these means the heat and smell of the gas in the rooms is avoided; and the light coming from one side, like that of day, is much more natural and agreeable. The burners and reflectors, &c., should, of course, be removed during the day."

Ink Stains may be taken out of paper in a minute or two by applying a little chloride of soda with a feather or hair-pencil; and the paper rendered as fit for use as before by doing over the spot with isinglass, gum-arabic, or the white of an egg.

Locomotion.—T. M. desires again to invite attention to the locomotive machinery of which he sent us a notice about two years ago (vol. xiv. p. 389). He affirms that it will enable any body "to travel on a good road ten miles an hour by his own exertion;" and this "without the aid of fire, steam, gas, or water." We are afraid he protests too much. Has he duly considered that no possible combination of the mechanical powers can have the smallest motive-power within itself? We are afraid not; otherwise he would scarcely propose to enable a man to walk quicker by giving him the weight of a machine to move in addition to his own.

Drawing Perpendiculars.—Mr. J. S.'s mode of drawing a perpendicular line at the end of another, is familiar to mathematicians, and is but one of many *known* methods by which "a space beyond the end of the line" is rendered unnecessary.

A *Fire Screen for Ladies.*—Draw a landscape on paper with Indian ink, representing a winter scene, or mere outline; the foliage is to be painted with

muriate of cobalt .... green.
acetate of cobalt .... blue.
and muriate of copper......... yellow.

which will all dry invisible. Put the screen to the fire, and the gentle warmth will occasion the trees, flowers, &c., to display themselves in their natural colours, and winter is thus magically changed into spring.—N. B. When the paper cools, the colours disappear, but the effect can be reproduced at pleasure.—G. C. LAWSON.

Mr. Trevithick.—We regret to learn that this distinguished engineer, who may justly be regarded as the father of steam locomotion in England, died on the 22d inst. at Dartford, in Kent, after a few days' illness. He was in his 67th year.

The London and Birmingham Railway Bill has at length passed both Houses of Parliament; and in a month or two operations will have commenced at both ends of the line.

A Platoon of Locomotives.—Since "nothing is new under the sun," why may we not again see the day when, like Sisera, the general of Jabin, King of Syria, we shall carry into campaigns 900 chariots of iron. Let us consider the effect of a platoon of locomotives moving along a road against a closely-cemented column of the enemy. Its united muscular strength, if it could be applied, would not stop them. The column must be scattered or crushed; and if either work should be left unfinished, it is only necessary to turn the steam, and back they will come with equal force, to the utter destruction of every thing that may attempt to oppose them. It is perfectly true that cannon could destroy the machinery, and so it will the wheels and timbers of guns; but this is deemed no valid reason against the employment of artillery.—*United Service Journal.*

INTERIM NOTICES.

We think it right to state, that since sending to the Printer's the letter of "Junius Redivivus," which we this day publish, on the Undulating Railway, we have received Mr. Badnall's book; and that it seems to us, on a hasty perusal, to furnish all those explanations of the want of which "Junius" complains. We shall give an analysis of it next week.

Communications received from Mr. Baddeley—G. M.—V. L.—Mr. Rutter—S. S.

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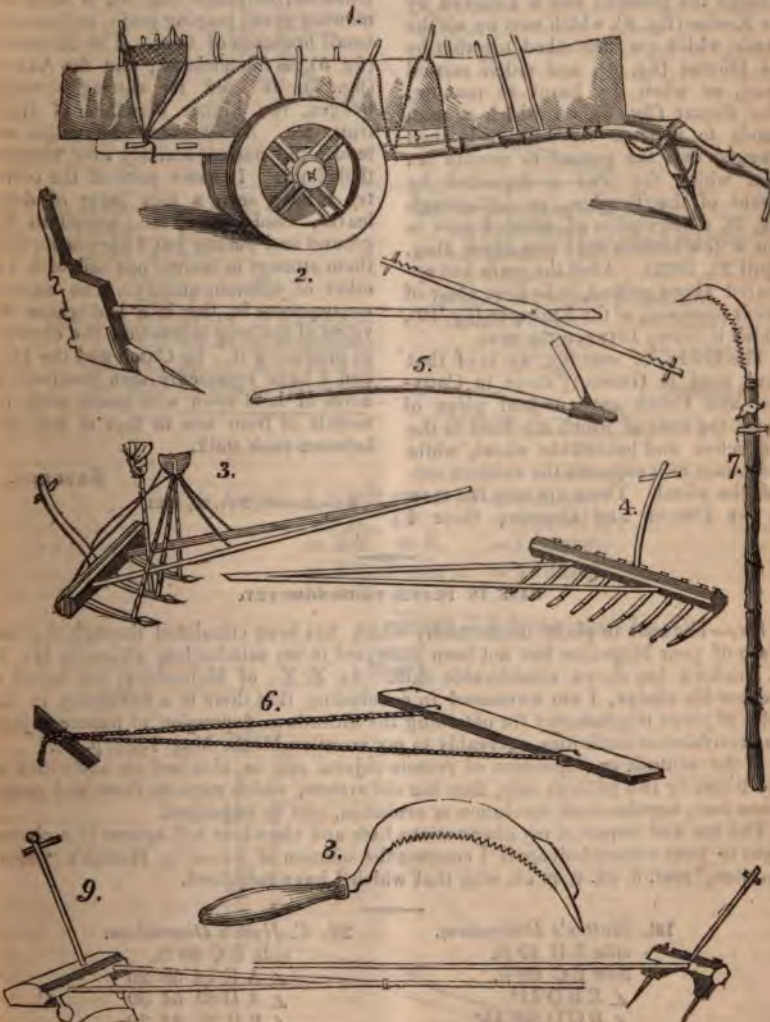
Mechanics' Magazine,

MUSEUM, REGISTER, JOURNAL, AND GAZETTE.

No. 509.] SATURDAY, MAY 11, 1833. [Price 3d.

INDIAN IMPLEMENTS OF HUSBANDRY.



INDIAN IMPLEMENTS OF HUSBANDRY.

Mr. Editor,—A friend of mine has been kind enough to favour me with the accompanying sketches of Indian implements of husbandry. These implements, with slight variation in the form, are in general use throughout the north-western part of the peninsula of India.

After the first fall of rain, which generally occurs in the middle of June, the Nungur, or plough (fig. 2), is passed through the ground; this is followed by the Kooloo (fig. 9), which cuts up all the weeds, which are then raked together by the Duntar (fig. 4), and either carried away, or when dry burnt as manure. The Sumar (fig. 6), on which a man stands to increase its weight, is then dragged over the ground to smooth it; after which the seed is deposited by means of the Turphen, or drill-plough (fig. 3), a description of which I sent to you a few months back (see Mech Mag. April 21, 1832). After the grain has appeared above ground, it is kept clear of weeds by means of the Kurburee (fig. 10), which is drawn between the rows.

The Garee, or cart (fig. 1), is of that kind used in Guzerat; those in Cattywar and Cutch have a bent piece of wood, the ends of which are fixed to the cart before and behind the wheel, while the centre of it supports the axletree *outside* the wheel. There are very few carts in the Deccan and Concon; those I have seen are awkward, mis-shapen things, with wheels either made of *stone* or thick boards roughly put together and cut in a tolerably circular shape. The bar in the front of the Garee is placed on the bullocks' necks and fastened by a leathern thong under the throat, so that the bullocks draw from the hump. When the cross-bar is placed over their necks, the leg on which the cart rests is, of course, raised from the ground. The Durattee, or sickle (fig. 8), is used for mowing grass, reaping grain, and cutting small branches of trees. The Roodalee (fig. 5), is the pickaxe; and the Akeree (fig. 7), is used for cutting through hedges, the higher branches of trees, fruit, &c. As far as my observation extends, the natives scarcely ever manure their lands. In some parts of the country I have seen a thin layer of dried leaves, weeds, grass, &c., spread on the ground and burnt; but I have never seen them attempt to temper one soil with another of different quality. The natural consequence is, that in a bad season the value of the crop is less than the expense of producing it. In Cutch and the Deccan I have repeatedly seen hundreds of acres of land sown with grain, with intervals of from one to four or five feet between each stalk.

BERGEIN.

Ootacamund, Nov. 25, 1832.

CASE IN PLANE TRIGONOMETRY.

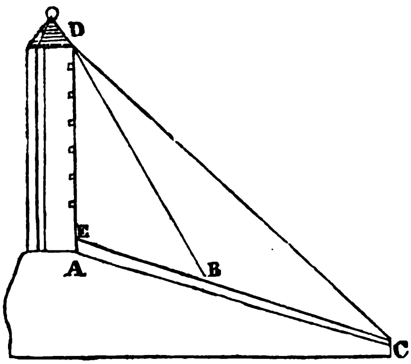
Sir,—The case in plane trigonometry which has been circulated through the medium of your Magazine has not been answered to my satisfaction, although Mr. E. J. Erichsen has shown considerable skill. As Z. X., of Malmsbury, has failed to redeem his pledge, I am warranted in concluding that there is a deficiency in the rules of plane trigonometry for obtaining the altitude or depression of remote objects on acclivities or declivities, agreeably to my assertion Mech. Mag. 1832, p. 78.

If the altitude or depression of remote objects can be obtained on acclivities or declivities by two statings only, then the old system, which requires three and sometimes four, together with involution or evolution, will be expunged.

The use and import of my observations here and elsewhere will appear in a clearer light to your correspondents if I contrast the solution of a case in Hutton's "Mensuration," sect. 3. ex. 6. p. 51. with that which I have subjoined.

1st. *Hutton's Dimensions.*	2d. *C. Hyde's Dimensions.*
side E B 40 ft.	side B C 60 ft.
side B C 60 ft.	$\angle$ A E 14 58 20
$\angle$ E B D 41°	$\angle$ A D 62 54 30
$\angle$ B C D 23° 45′	$\angle$ F B 21 54 30
Instrument 5 ft.	$\angle$ F D 45 39 30

Hutton's.



1st in the triangle B D C

$\angle$ 13 41° } subtract.
$\angle$ 6 23 45

17 15

sine $\angle$ B D C 17° 15′ = 9·4720856
$\angle$ C 23 45 = 9·6050320
so B C 60 ft. = 1·7781513
to B D 81·488 = 1·9110977

2d. in the triangle B D E

B D 81·488 } add and subtract.
B E 40

As sum 121·488 = 2·0845334
to dif. 41·488 = 1·6179225

$\frac{E + E D B}{2}$ = 10·4272623

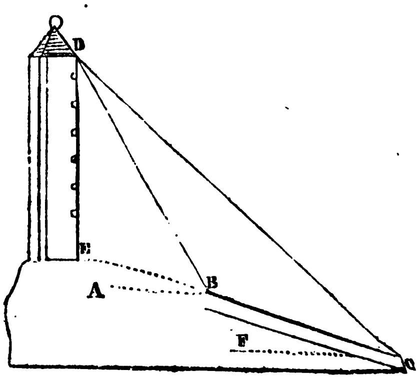
9·9606514

to tang· $\frac{E - E D B}{2}$ = 42° 24′ 30″

3d. As sine $\angle$ E D B 27° 5 30 = 9·6584077
$\angle$ B 41° = 9·8169429
so B E 40 ft. = 1·6020600
to E D 57·623 ft. = 1·7605952
add A E 5

62·623 = A D the whole height.

Hyde's.



1st. in the triangle B D C

$\left.\begin{array}{l}\angle B\ 62^\circ\ 54'\ 30'' \\ \angle C\ 45\ \ 39\ \ 30\end{array}\right\}$ subtract.

sine $\angle$ B D C $17^\circ\ 15' = 9{\cdot}4720856$

$\angle$ B C D $23\ 45 = 9{\cdot}6050320$

to B C 60 ft. $1{\cdot}7781513$

to BD $81{\cdot}488 = 1{\cdot}9110977$

2d. A E $+ 90 = 104^\circ\ 58'\ 20'' = 9{\cdot}9850001$

A D − A E $= 47\ \ 56\ \ 10 = 9{\cdot}8706369$

to D B as before $1{\cdot}9110977$

E D $62{\cdot}623$ height $= 1{\cdot}7967345$

It will be immediately perceived that my solution is produced by a much shorter process than Hutton's; and, I may add, that this plan is applicable to all similar cases, without having access to the bottom of the object.

I am, Sir, your humble servant,

CHARLES HYDE, Surveyor.

Horsley, Gloucestershire, April 11, 1833.

THE PRINCIPLE OF MALLET'S STONE SPLITTING SCREWS—WHITELAW'S IMPROVEMENT ON BARKER'S MILL—INSTRUMENTS FOR FORMING SPIRALS—CONDENSATION AND REFRIGERATION, &c.

Sir,—In the Mech. Mag. for 2d March last, Mr. Mallet has appropriated as his own an invention which I published, through the same medium, on the 8th September preceding. A moment's inspection of the two articles will convince any person that they both set forth the same; so much so, that I am sure the reading of one of them would lead to the expectation of seeing the same signature at the foot of the other. If Mr. Mallet had claimed only the application of the invention, after having made due acknowledgment of the source from whence he had derived its principle, I should not have complained; nay I should have been, on the contrary, well pleased, and have wished him joy of whatever honour or profit he might gain by it. Being, as I am, debarred the great privilege and advantage of having time and means to test and improve any invention that may occur to me, I have looked to the pleasure of seeing my suggestions taken up and carried forward to perfection by talented practical men, as that which was to console me under the privation. I have, therefore, avoided the blame of the dog in the fable, and freely communicated what I could not myself derive any pecuniary profit from. In proportion, however, as I find that profit beyond my reach, I am the more jealous of another profit which may still be mine,—the reward of honour, of that first-rank honour *which he merits who has achieved the mental labour of breaking* down any of the barriers which imprison us in ignorance, and has thereby admitted a new ray of discovered knowledge to light us on to more. This is the only reward of the inventor, circumstanced as I am, and being, to my taste, a very high one, I shall not patiently suffer any one to wrest whatever little I may have merited in that way from me. Perhaps the less that little is, I shall be found the more querulously vigilant of its possession. In thus launching out at length, Mr. Editor, on a matter so very trifling, as I am free to confess that at issue between Mr. M. and me is, I have chosen rather to assume, as it were, the place of a person who had really made a discovery worthy of giving a new era to the world, than to speak in my proper person; and I have thus endeavoured to express the feelings and sentiments of such a person in defence of rights the dearest of any to a soul of the least inspiration, but which are too often and too flagrantly violated. Before I leave the subject I must, I fear, take from Mr. M., by anticipation, the only support on which he could maintain his side of the claim. He might urge, that this is but one more instance of two minds, thinking independently of each other, arriving at the same conclusion, in which case each possesses an equally good claim to the palm of invention. In answer to this, I quote him a paragraph from his communication, which seems to me to contain internal evidence that Mr. M. had read my previous communication, along with the stricture passed on it by a correspondent, Trebor Valentine, I believe. This is the paragraph:—"Now I am fully aware of the objection that may be urged of a

conical screw being applied to a cylindrical one, and of the threads of a conical screw making variable angles with the axis," &c. I, therefore, call upon Mr. M. to acknowledge my right to the inventorship of the principle, of which he has just announced so satisfactory and important an application; and in case he should refuse, which I do not think he will, I appeal to the decision of your readers and contributors in general.

I have yet further, Mr. Editor, if you will pardon my continued egotism, to say something similar with respect to the improvement on Barker's mill, extracted in your journal of the 2d March last, from the Franklin Journal, and contributed thereto by Mr. Whitelaw. If your readers will refer back to your preceding volume, p. 263, they will there find the principle of Mr. W.'s improvement suggested by me, along with something more besides. I do not mean, however, in this case also, to bring an accusation of piracy, for there is nothing in Mr. W.'s communication, or in the circumstances under which it is made, to shew that he may not have been pursuing a train of thought quite independent of mine, though we both jumped to a conclusion so nearly the same. Nay, I have to accuse Mr. W. of knowing too little of what others have done, otherwise he would not have made the mill retrograde a step from improvement, and resumed the clumsy tube-shaft so long laid aside. In my communication which I have alluded to, I have proposed this same curvature of the arms of the mill; and, besides, to box them up, and make them work immersed in the water that has come from them; and I cannot help thinking this is a step in advance of Mr. W.'s.

I have now to apologise to Mr. Murdoch, for having unwittingly done an injustice to his invention. The set of the Mech. Mag. to which I have access is very imperfect, and the access I enjoy extremely limited, so that I do not think I have ever seen the account of Mr. M.'s instrument. Mr. Child's I have seen the account of; but, as well as I recollect, his performance does not invalidate my assertion, in its strict sense. I said, that no manageable complication of wheels could produce an infinite variety of figures; and, if I remember aright, Mr. Child is obliged to add a rectilinear slide to his system of wheels, and thereby communicate to them that property which they had not of themselves: for, to add a slide in that way, is to multiply, by an infinite number, a finite number of variations. To Mr. M.'s objection about the central point, I have to answer, that I retained that in the construction on purpose, having in my eye those artists who require to describe large figures, and seldom require to draw lines very near the centre; but that the method of getting rid of the point, by making the surface revolve while the instrument is fixed, seemed to me a corollary, from the construction given, too obvious to require notice.

I beg to assure Mr. Rutter, that it is with no less pride than pleasure that I find I have been wandering near the tract he is pursuing with so much advantage. I have not seen the treatise from which he quotes, but have long come to similar conclusions with respect to the necessary and reciprocal connexion between condensation and refrigeration. Has Mr. Rutter ever tried to freeze water by passing through it, in minute currents, air previously condensed and refrigerated? This is an experiment I have long wished to try; perhaps it may not lie out of Mr. R.'s way.

As Mr. Downing has done me the honour to acquaint me with the direction his powerful mind is taking through the region of inventive thought, I beg to offer him my best thanks, and to assure him that I, in common I am sure with the other readers of the Magazine, shall await with impatient expectation whatever his head or hand may produce. If, however, I had the privilege of a friend, Mr. Editor, I would respectfully suggest to Mr. Downing to be cautious whether he may not have chosen a subject on which even his energies may suffer wreck. It strikes me that, if it require the aid of Government to enable Mr. Babbage to embody his designs in the necessary machinery, a similar attempt must be far above the reach of private means. Were the matter one of mere mental achievement, I should only urge Mr. D. to the attempt, however difficult; but when the agency of matter is to be called in, and of that which is the life of matter, money, I should wish to dissuade

Mr. D. before he had well counted his cost. I am, Sir,

Your obedient and obliged servant.

φ. μ.

SHALDERS' PATENT GRAVITATING EXPRESSING FOUNTAIN.

Sir,—On my return to town, I find in your Mag. of the 9th Feb. last a letter addressed to me by Mr. Shalders, to which it is necessary I should offer a few words in reply. But I must, in the first place, express my disapprobation of the personal manner in which Mr. Shalders has been pleased to address me. Had this letter been sent for my private perusal, well and good; but, having been sent to you Mr. Editor, for publication, it should have been *addressed*, as mine are, *to you*. It is an established custom, in large assemblies, for any person speaking to address himself to the individual who presides, and I take it the same thing should hold good with the correspondents of any periodical work: if another contributor is to be replied to, it should be done in the usual way, through the Editor. This wholesome regulation has more than once been disregarded by some of your correspondents: perhaps, Mr. Editor, you will see the propriety of enforcing attention to this rule in future.

With respect to the frictionless pump of Mr. Martin, and that constructed by Mr. Shalders, it appears that the only difference claimed by the latter gentleman, is the *conical form* of the barrel and piston. Now, although I unhesitatingly admit his claim to this difference, still I deny that it is such *an essential alteration or improvement*, as to justify Mr. Shalders in patenting and publishing the pump as his own.

The conical is, doubtless, the best form, inasmuch as the leather diaphragm or connector is thereby supported through a considerable portion of its range, and relieved from that pressure to which it had been found inadequate.

Mr. Shalders states, that in Martin's pump the effective stroke was shorter than in his, and the action so destructive and distressing as to cause the failure of the pump. There is no ground however, to warrant such a conclusion. If the action had been so distressing, it would have been manifested by the existence of *friction*. We have good reasons to know, as I have already shown elsewhere, that the friction was reduced to a mere nothing, and I have yet to learn that the friction in Mr. Shalders' pump is still less. The stroke is not necessarily shorter in the one pump than in the other; and although Mr. Shalders would wish it to be understood that Martin did not use the *leather cone*, yet, from the length of stroke which he obtained in his pump, it is pretty certain that he must have used connectors of the conical form.

Mr. Shalders especially notices my remark, "that the fountain pump is totally unfit for the purpose of a fire-engine." However, I repeat the assertion; and every person who knows what *leather is*, and what *a fire engine is* or ought to be, will at once perceive the unfitness. In a pump with a short lift, in daily or perhaps hourly use, the "gravitating expressing fountain" may do very well. But as a fire-engine, where it is sometimes wet, and sometimes dry—perhaps been laying by unlooked at for months, when it is suddenly put in requisition and required to deliver a column of water some sixty or seventy feet high—the chances are about a hundred to one that the fountain-pump engine would fail.

Mr. Shalders may tell us that this may be remedied by proper attention and frequent working; but I answer, the difficulty of ensuring *this proper attention* is so great as to forbid the employment of any engine whose efficiency depends so much upon it.

When at Liverpool, a few weeks since, I saw some of the fountain-pumps recently erected for the purpose of affording a supply of water in case of fire, which to my great surprise were all locked up, and the chances are that, when wanted, they will be found useless. Had the parties having care of these pumps left them open to public use, they would have been kept in better order, and any defect sooner observed and repaired. Nothing destroys the leather of hydraulic machinery so much as alternate wet and dry, and inaction.

With respect to Mr. Shalders' patent, nobody will be so silly as to apply to the courts of law for a writ of *scire facias* to set it aside: it's not quite worth that trouble and expense. If any body happens to be smitten with the charms of the pump in question, they will use

it, and leave Mr. Shalders to apply to the Court of Chancery, if he thinks fit.

One is just as *manly* a course as the other, and there is a choice.

I remain, Sir, yours respectfully,
W. BADDELEY.

London, April 8, 1833.

GAS-LIGHTING.

Sir,—At the period when Dr. Priestley had attained the highest celebrity by his discoveries, and resided in the vicinity of this great manufacturing town, I acquired a taste for chemical pursuits, which engendered an ardent admiration of all the efforts to promote and establish gas illumination. Several years before Mr. Murdoch's grand exhibition at Soho, 1802, (of which I was one of the many thousands of spectators,) I witnessed numerous experiments demonstrating the practicability of its extensive application. I believe, too, that I have read every publication that has appeared in our language relating to this interesting subject, and recently the pamphlet by Mr. J. O. N. Rutter of Lymington, who professes to have "endeavoured to furnish useful and accurate information." I trust, therefore, that Mr. R. will not be displeased with my pointing out a few erroneous statements which I have noticed in the perusal of his work.

In page 3 Mr. Rutter refers to the fact communicated by Thomas Shirley, Esq. to the Philosophical Transactions for 1667, and states, that "about the year 1736 Dr. John Clayton, Dean of Kildare, having seen a precisely similar phenomenon, &c., determined to pursue the subject, and, if possible, to ascertain the origin of the spirit of coal." But instead of this circumstance occurring in 1736, it must have happened about half a century earlier; for the letter detailing Dr. C.'s experiments was actually addressed to Mr. Robert Boyle, who died in 1691, although it did not appear in the Phil. Trans. till 1739; whence it is obvious that the properties of coal-gas, so strikingly ascertained and minutely described by Dr. C., not only passed unnoticed and unimproved for almost sixty years, as stated by Mr. Rutter, but for a period of more than 100 years.

Mr. Rutter affirms, page 9, that "carburetted hydrogen emits only a comparatively feeble light, and is therefore inapplicable to the purposes of illumination." Is this an accurate description of the qualities of the compound commonly denominated carburetted hydrogen? At page 13, in the note, the flame of pure hydrogen gas is stated to be of a pale green colour. Does this colour accord with its appearance in the experiments usually exhibited? And is not it generally described as blue in the most popular works on chemistry?

Though the above particulars may not be very important, they shew that implicit reliance ought not to be placed on Mr. Rutter's declaration at the conclusion of his pamphlet, where he avers it to have been his "chief concern to verify every statement; and (that) he is therefore enabled to assert their accuracy by a confident appeal to the test of experience."

If my recollection be correct, the only preceding writer who, in relating Dr. Clayton's experiments, mentions his being "*Dean of Kildare*," is Mr. Matthews, at page 14 of his admirably instructive History of Gas-lighting, on which, as also on his Compendium of the Practice of Gas-lighting, you bestowed at the time of their appearance very liberal and just commendations. Besides this fact concerning Dr. Clayton, other expressions in Mr. Rutter's pamphlet shew that he had read both the publications of Mr. Matthews. How happens it, then, that Mr. Rutter has never made any mention of either? The omission may have been unintentional; but recollecting as I do the disinterested and zealous efforts of Mr. Matthews in his younger days for the diffusion of useful knowledge in this populous town,* I cannot without regret see him thus passed over without that notice which is fairly his due. The pretensions and empiricism of Winsor, Accum, and others, are ably exposed in his History of Gas-lighting, where he never fails to quote his authorities, being guided by the maxim of Pope—

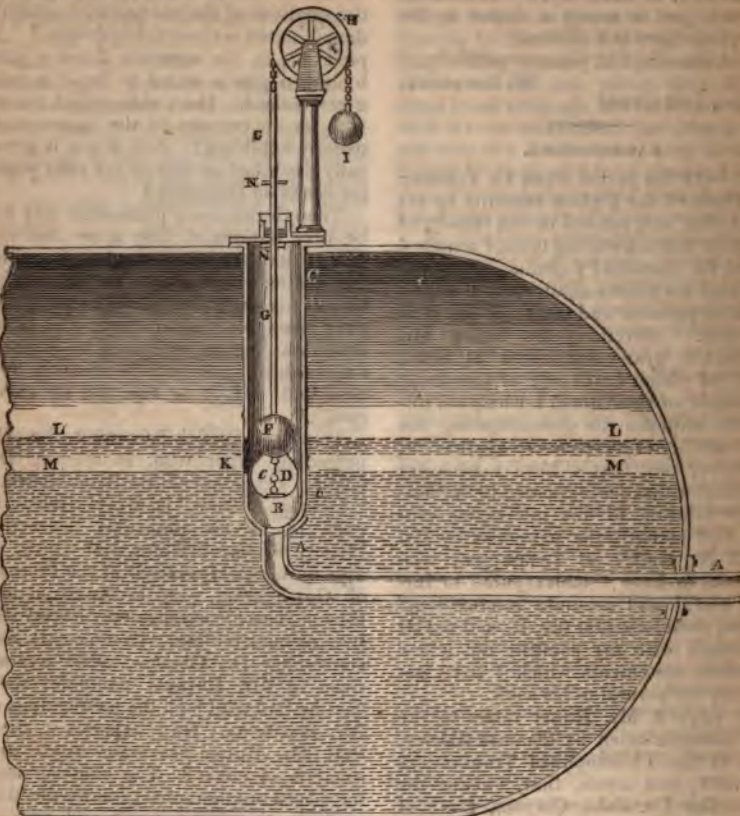
"O grant me honest fame, or grant me none."

I am, yours truly,
J. P. N.

Birmingham, May 1, 1833.

* See his Sketch of the Means employed to Improve the Intellectual and Moral Condition of the Working Classes of Birmingham.

APPARATUS FOR REGULATING THE SUPPLY OF HIGH-PRESSURE STEAM-BOILERS.



Sir,—The above sketch exhibits a plan of an apparatus for the supplying of high-pressure steam-boilers with the necessary quantity of water, a desideratum which has for a considerable period occupied the attention of the scientific world. It is not my intention to place this before the public as a scheme not likely to be improved upon, but merely to contribute, as far as my abilities will allow, to the accomplishment of an arrangement in the economy of the steam engine, which is admitted by all to be of paramount importance.

A represents the feeding pipe coming from the small water pump of the engine, which is made without a discharge valve.

B, a valve placed at the bottom of the small cylinder C, answering to the *discharge valve of the small* water pump *(before mentioned).*

C, a cylinder, having the valve B ground into the bottom of it, and to which is attached the pipe A.

D, a chain connecting the valve B with the metal ball F.

E, a dotted circle, which represents the ball F when the water in the boiler is low.

F, a metal ball shewn in the position of the boiler being full: this ball is suspended to a thin rod, passing through the stuffing box in the top of the cylinder.

G, a slender rod to which the ball F is attached, and which has a small chain or cord passing over the pully H to the counter-balance I.

H, a pulley; and

I, the counter-balance, to which the ball F and valve B are suspended.

K, an oblong hole, about two inches

long and one broad, to allow the water to pass from the cylinder C into the boiler.

L, the high water line, and

M, the low water line, within the boiler.

N N, two keys to prevent the rod going too high or descending too low within the cylinder.

The action is as follows:—The small water pump is continually at work from the engine; but, as the apparatus now stands, there will be a free communication between the boiler and cylinder of the pump; therefore each time the piston ascends, instead of the water rising from the well, a quantity will proceed from the boiler through the valve B, and back again into the boiler with the descent of the piston; nor will the water ever increase upon the boiler till it shall have evaporated down to the line M, when the ball F will descend to the dotted circle E, on which the valve B will fall into its seat, and act as the discharge valve to the small pump, until the water shall have risen high enough to float the metal ball F to its present position, when its action will cease. To adjust the counterbalance to the ball F, it should be of equal weight, subtracting the weight of an equal bulk of water, and the pressure of the steam upon the area of the rod G. The oblong hole is limited to the difference of the height of the water in the boiler.—Yours, &c. E. F. W.

OIL-TIGHT FABRIC—CAOUTCHOUC BALLS.

Sir,—A Constant Reader will, I think, be able to make an oil-tight vessel if he can undertake to adapt the sides to his "top and bottom of hard wood." I should recommend him to have the sides double, the interior of caoutchouc, the exterior of flexible but strong leather. I have no means of ascertaining at this moment if caoutchouc is impervious to oil; but I cannot doubt it. The leather will be necessary to prevent the bursting of the vessel "under considerable pressure." The caoutchouc will readily expand to the dimensions of the leather by which it is enveloped. The mode I employ for making caoutchouc balls is exceedingly simple. Take what is termed by the stationers an indian-rubber bottle, tie its neck firmly to a condensing syringe, immerse the bottle for about a minute in hot water, and then slowly force air into it. If the bottle be sound and tolerably uniform in its structure, it will expand until it assumes throughout an attenuated appearance. If it be unsound, or very irregular, it will burst, and be rendered useless. I have had three bottles burst under my hands in succession. The largest ball I have ever made was 17 inches in diameter. I have found a use for these balls since my last communication on the subject. You shall know more of the matter hereafter.

J. O. N. RUTTER.

April 30, 1833.

MR. BADNALL'S TREATISE ON RAILWAY IMPROVEMENTS, AND IN PARTICULAR THE UNDULATING RAILWAY.*

The principal subject of the treatise before us is introduced by a preliminary exposition of the advantages of railway conveyance, and an examination of the obstacles to their immediate general establishment. Among these obstacles the "difficulty of ascending inclined planes by locomotive power" occupies a foremost place. The employment of "stationary engines," or "locomotive engines with cog-wheels," to overcome this difficulty, is briefly adverted to, but justly pronounced to be attended "with serious if not insuperable inconveniences." Mr. Badnall's attention having been "particularly directed" to the discovery of some better remedy, the idea at length occurred to him that a sufficient power might be gained by the descent of a body down one inclined plane to compensate for the opposition from gravity in ascending another; and if so, that a railway uniformly constructed in such an up and down, or undulating plan, might be economically substituted for the partly horizontal and partly inclined railways at present in use.

"The improvement occurred to me on the 7th of June, 1832. The impressions on my mind, before the trial of any experiments, were that by an undulating railway a greater resistance would be opposed to the power of steam, or any other locomotive power, than upon a level railway; but that much would be gained by the power of gravity, multiplied by active power, down a descent; and that, consequently, a locomotive-engine of any given power would travel at a greater speed, or

* A Treatise on Railway Improvements, explanatory of the chief Difficulties and Inconveniences which at present attend the General Adoption of Railways, and the Means by which these Objections may be Overcome; as proved by a Series of Interesting Experiments, &c. By RICHARD BADNALL, Esq. 142 pp. 8vo. Sherwood and Co.

drag a greater weight, than upon a horizontal railway. I was also of opinion that the increased resistance or fulcrum, offered by the descending part of each curve, and the advantage gained by the power of gravity multiplied by active power, would be sufficiently great to render locomotive-engines more effective than they have at present proved to be upon inclined planes."—P. 31.

Mr. Badnall, after some explanatory remarks on the subject of friction and gravity, proceeds to describe the different experiments which have, in his opinion, fully established the soundness of these his preconceived opinions. Some of the more striking of these we shall here lay before our readers.

"I ordered a small engine to be manufactured, on clock-work principles, with a strong spring in a barrel, and a fusee sufficiently large to admit of travelling the length of 50 or 60 feet, being also particularly anxious that the power of the spring should be sufficient to overcome the pressure of the engine-wheels on the plane, when kept from progressing. Wishing to try these experiments as privately as possible, during the time which the manufacture of the engine occupied, I was engaged at Douglas, in the Isle of Man, in superintending the making of two railways, the one curved, the other horizontal. These were each 32 feet in length (the length of the most spacious room I could find unoccupied); the length of the ascent and descent of each curve, or undulation, was *one foot;* and the height and depth of each curve from the centre, was half an inch, or one inch from the summit of the convex to the base of the concave of the curve. I had also ordered a small carriage to be made, to be attached to the engine, when necessary, and to run upon four wheels of the same diameter as the wheels of the engine.

"On the 23d July I received the engine and carriage from Liverpool; their weights were as follows:—

Weight of engine	9lbs. 6oz.
Weight of carriage	3lbs. 10oz.
Diameter of wheels	3 inches.
Width of the periphery of the wheels	⅜ of an inch.

"On trying the strength of the spring, I was sorry to observe that it was not sufficient, when I placed the carriage on a smooth surface and prevented its progression, to turn the wheels; that is, it had not power, as I wished it to have, to overcome the adhesion, or friction, between the wheels of the carriage and the surface of the plane.

"I, however, resolved to try a series of experiments with it, and afterwards to return it to Liverpool, to have a stronger spring attached to it.

"Accordingly, I had the railways placed firmly down, and upon as exact a level as circumstances would permit. The distance between the lines on each railway was eight inches; the width at the surface of the rails was half an inch; the distance between the wheels of the engine governed, of course, the width between the lines; and care was taken to give the carriages sufficient play, to prevent them being bound by friction against the sides of the rails.

"Having ascertained that both railways were level, the spring was wound up, by drawing the engine backwards from the end of the line to the commencement. It was started without any weight attached, and the following was the result:

Curved Railway,	Horizontal Railway,
6 seconds.	7 seconds.

"I then placed 7lbs. weight upon the engine itself, which had a platform for such purpose; the result was,

Curved Railway,	Horizontal Railway,
8 seconds.	9 seconds.

"I then attached the small carriage to the engine, and, without load, I found the speed of travelling along either line, was in the same proportion as before.

"I then tried various weights in the carriage, and invariably found a decided advantage in the curved railway. This advantage was, however, more evident in the following experiments:—

With 17 lbs. weight in the carriage.

From North to South.

Curved Railway,	Horizontal Railway,
15½ seconds.	20½ seconds.

From South to North.

Curved Railway,	Horizontal Railway,
17 seconds.	22½ seconds.

"Now, omitting the half-seconds, and taking the averages, the difference of space which the engine would have travelled over on the curve, in the time required to travel 32 feet on the horizontal plane, is as follows:—

16 : 32 : : 21 : 42 feet;

shewing a difference of nearly one-third in the speed.

"Thinking it probable that, by the variation in the time occupied in traversing the lines from different sides of the room, that they might not be perfectly level, I had them again examined and adjusted with particular caution; after which, on again trying, with the same weight, viz. 17 lbs., the result was as follows:—

From North to South, and South to North.

On the Curve,	On the Level,
16 seconds.	22 seconds.

"This last experiment was repeatedly tried, and without any distinct variation; the time was ascertained by a second-hand watch, and carefully noted by Mr. J. L. Gardener, of Manchester, who witnessed the experiments, as well as myself.

"Although I perceived that 17 lbs. was as great a weight as the engine could well convey upon the horizontal railway, I was anxious to try the result of greater, and increased the load to 22 lbs. The result was,

From North to South.

On the Curve,	On the Horizontal Line.
17 seconds.	30 seconds.

From South to North.

On the Curve,	On the Horizontal.
18 seconds.	28 seconds.

"It was here quite obvious, that the curve produced a far more decided advantage; and this advantage was evident at starting; as, on the horizontal road, the engine moved very slowly at first, and traversed 12 or 18 feet before it attained its average speed; whereas, upon the curved line, its motion was apparently regular throughout.

"Although these experiments were, in every point of view, so satisfactory, in regard to speed, I was surprised to find that the advantage was not so great as I anticipated in regard to the difference of load the engine was capable of dragging on the two lines. I, however, clearly proved that we could convey a much greater weight upon the curved line than upon the plane; for when the engine would not move at all upon the horizontal road, it would travel without difficulty upon the curve; and it is extraordinary, that in conveying any weight, from 15 lbs. upwards, on the latter, the time occupied in doing so, varied in a very trifling degree.

"The same comparative results took place up an inclined plane of 1 in 144."

A second undulating railway having been constructed, with a curve of five feet ascent and descent, and two inches in depth, and some alterations having been made in the engine, which made it both stronger and lighter, the following additional experiments were made:—

	Number of Seconds.		
	Horizontal Plane	1-foot Curve.	5-feet Curve.
Engine alone, weighing 9 lbs. 4 oz. and the hind and fore-wheels $\frac{5}{16}$ inches apart..............................	5	4	$3\frac{1}{2}$
Ditto, and carriage, weighing together 12 lbs. 14 oz........................	$5\frac{1}{2}$	$4\frac{1}{2}$	4
Ditto, with 5lbs. in carriage............	$6\frac{3}{4}$	$5\frac{1}{4}$	$4\frac{1}{2}$
Ditto, with 10 — in ditto..............	$8\frac{1}{2}$	$6\frac{1}{2}$	$5\frac{1}{2}$
Ditto, with 15 — in ditto..............	$9\frac{3}{4}$	7	6
Ditto, with 20 — in ditto..............	$13\frac{1}{2}$	$8\frac{3}{4}$	$7\frac{1}{2}$
Ditto, with 25 — in ditto..............	18	11	9
Ditto, with 30 — in ditto..............	30 could scarcely go.	14	11
Ditto, with 35 — in ditto..............	could not go.	18	12
Ditto, with 40 — in ditto..............	....	......	13
Ditto, with 45 — in ditto..............	....	......	15

After repeatedly trying these experiments, and always obtaining the same results, Mr. Badnall had another railway constructed, with *short* ascents and *long* descents:

"The length of each descent being 8 feet; the length of each ascent 2 feet; and the whole line being 32 feet. It consisted of 3 descents, 3 ascents, and a platform of 1 foot at each extremity, the tops of which were on an exact level with the summits of each ascent; the depth of descent at the lowest point being 2 inches from the highest rise, as in the railway whose curves were 5 feet. It is necessary to remark, that the descents in this railway, except about a foot from their lowest points, were regular inclined planes, curving off at the bottom, to render the ascents more regular, which ascents were also curved."

The following table exhibits the results of this modification of the undulating principle:—

Number of Seconds.

	On the perfect Level.			Weights.	Inclination of 1 in [illegible].		
	Horizontal Plane.	5-feet Curve.	Long & Short Curve.		Horizontal Plane.	5-feet Curve.	Long & Short Curve.
Engine alone...........	5	3½	4		6¾	5¼	5¼
Do. and carriage........	5¼	4	5	lbs.	7¾	6	6
Do. with 5lbs.	6¾	4½	6	1	8½	6¾	6½
——— 10 —	8¼	5½	7	2	9½	7	7
——— 15 —	9¾	6	7½	3	11	7¾	7½
——— 20 —	13¾	7½	8	4	12	8¼	7¾
——— 25 —	18	9	8½	5	13¾	8¾	8
——— 30 —	33	11	9	6	16¾	9¼	8½
——— 35 —	....	12	10	7	22	10	9¼
——— 40 —	....	13	11	8	30	12	9½
——— 45 —	....	15	12	9	....	14	10¼
——— 56 —	....	......	14	10	....	......	11
——— 58 —	....	......	14½	11	....	......	12
——— 59 —	....	......	14¾	12	....	......	13
——— 60 —	with great difficulty		16	13	....	......	15½
	....	......	......	13½	....	......	16

Mr. Badnall states, that on trying the engine on this long and short curved railway, *the reverse way*, that is, by causing it to descend the short curve first, "the result was found to be the same."

It was observed, in the course of the preceding experiments, that when heavy loads were passed over the railways, a considerable degree of vibration was occasioned. To get rid of this possible source of error, the different railways were next nailed firmly down upon three inch planks, and the following experiments made in the presence of Mr. Gill, of Manchester, one of the directors of the contemplated Manchester and Leeds railway:—

On a Perfect Level.

			Number of Seconds.		
			Horizontal Plane.	5 feet Curve, rise, 1 inch.	Irregular Curve, rise, 2 inches.
Engine and carriage,	without load	....	5¼	4¾	4¾
Ditto ditto	with 5 lbs.	....	6¾	6	6
Ditto ditto	10 —	....	8¼	6¾	6½
Ditto ditto	15 —	....	9½	7½	7¼
Ditto ditto	20 —	....	11½	8½	7¾
Ditto ditto	25 —	....	13¼	9⅛	8½
Ditto ditto	30 —	....	15½	10	9
Ditto ditto	32½ —	....	18¼	10½	9½
Ditto ditto	35 —	....	20	11	10¼
Ditto ditto	37½ —	....	21¼	11½	10½
Ditto ditto	40 —	....	23½	12	10¾
Ditto ditto	42½ —	....	29	12½	12
Ditto ditto	45 —	....	....	13½	12¼
Ditto ditto	50 —	....	....	16	12½
Ditto ditto	55 —	....	....	19	17

Experiment up an Inclined Plane of 1 in 96.

Engine and carriage,	without load	....	5½	4¾	4¾
Ditto ditto	with 2½lbs.	....	6½	5½	5½
Ditto ditto	5 —	....	7¼	6	6
Ditto ditto	7½ —	....	8½	6½	6½
Ditto ditto	10 —	....	9	7¼	7
Ditto ditto	12½ —	....	11	8	7½

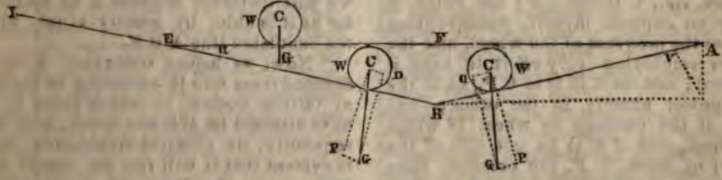
			Horizontal Plane.	5 feet Curve, rise, 1 inch.	Irregular Curve, rise, 2 inches.
Ditto	ditto	15 —	12½	8¾	8
Ditto	ditto	17½ —	14	9½	9
Ditto	ditto	20 —	15¾	11	10½
Ditto	ditto	22½ —	19	12	11
Ditto	ditto	24 —	27	12¾	12
Ditto	ditto	25 —	would not go	13	13
Ditto	ditto	27½ —		16½	16
Ditto	ditto	29 —		18¾	17

It will be observed, that the degree of speed on all the railways is much greater in these experiments than in any of those before recited. Mr. B. accounts for this by stating, that "the cord upon the spring barrel having broken, he was compelled to re-attach it, and regulate the power of the spring accordingly." Another circumstance that will strike the reader is, that, in the experiments before made, 30 lbs. was the utmost load which could be conveyed on the horizontal railway, while in the last set of experiments 42½ lbs. were conveyed. This difference Mr. B. attributes partly "to the renewed strength of the spring," and partly "to the freedom from vibration," obtained by making fast the railways to the three inch planks. A still more remarkable discrepancy, however, is that exhibited by the two curved railways, in regard to speed, in the different sets of experiments. In the first trial, for example, made with the long and short curved railway on a level, the rates of speed with all weights under 20 lbs., were less, by 1″ and 1½″, than on the five feet curved railway; while, in the last quoted experiments, there was scarcely any perceptible difference. In the case of all weights, again, above 20 lbs., the advantage was, in the former experiments, on the side of the long and short curve railway, to the extent, in some instances, of 3″, whiles in the latter the advantage rarely exceeded 1″, and in some instances only half a second. Mr. Badnall admits that these differences are not so susceptible as the others of explanation. "I confess myself in difficulty, and can only account for it by the difference in the vibration of the two railways, or some inaccuracy in levelling, especially as the depth of each curve was similar."

Be the difference however as it may between the two sorts of curved railways, Mr. B. thinks he is entitled to rest satisfied with the fact, that they have both, "whether upon the level or inclines, invariably proved an unquestionable and decided superiority over the horizontal railway." He estimates this superiority as being equal to a saving of one half in point of time, and a gain of twice the power in respect of weight.

Mr. Badnall's theoretical explanation of the advantage thus gained is as follows:—

"Suppose the line, E A, to be a horizontal railway,—A B, to be a descending one,—and B E, an ascending one, on which are placed the three wheels, W W W.



"1. Now, the amount of friction produced by the pressure of the wheel W on the plane E A, is in exact proportion to its weight, or to the weight of any vehicle which rests upon it; and upon such weight also depends the amount of attrition produced by the revolution of the axle within the nave or cylinder in which it moves.

The reason why the amount of friction, or attrition, is proportionate to the weight of the vehicle, is because (supposing C to be the axle or centre of the wheel) the perpendicular line, C G, is the line of gravity.

"On a horizontal railway, therefore, the amount of pressure upon the rails, and the amount of axle and rolling friction produced by that pressure, are in exact accordance with, and altogether dependant upon, the weight of the carriages and

load; and when locomotive power is employed to overcome this pressure and friction, and when a maximum velocity is attained, such velocity (the power being kept up) is uniform through spaces and times, and such pressure or friction is an *uniformly opposing power*. Moreover, as before frequently observed, the amount of load which any locomotive engine will convey, is in exact accordance with the amount of its pressure upon the rails and axles; or, in other words, with the axle and rolling friction.

"2. Let us now suppose the wheel W to be traversing from A to B. From the point A, it is evident that a body would fall to T, according to the laws of bodies falling perpendicularly; and if upon the line A B we draw the perpendicular line V T, a body would descend by gravity down the plane from A to V, in the same time as it would fall, perpendicularly, from A to T; and the power of gravity, which enables it to do this, acting *equally* (practically speaking) throughout the whole descent from A to B, would produce *an uniformly accelerated motion*; in consequence of which, on the arrival of the carriage at the point B, the velocity would (allowing for the difference of friction) be mathematically equal to what it would be at the point T, had it fallen perpendicularly from A to that point. Now the extent of the power of gravity, or cause of the wheel W descending down the incline A B, will be easily comprehended by reference to the parallelogram D C P G: where the diagonal, C G, is the line of gravity, C P the line representing the amount of pressure on the rail, and C D the line of motion; that is, the line or power of gravity, C G, instead of acting perpendicularly, and with full intensity, on the rail, as on the line E A, becomes divided into two separate and distinct powers, viz., C D and C P; the latter, if I may so express myself, endeavouring to stop the progress of the wheel, and the former employing every effort to urge it forward; and as C D is to C P, so is the one power exactly to the other;—and thus, if the carriage or wheel W weigh five tons, and if C D be one-fifth of the power or force, C P, the pressure upon the rails is reduced from five tons to four tons; and *not only reduced*, but the amount of power thus saved is actively employed in opposing the resistance offered by C P.

"Such would be the *commencement* of the progress of a carriage descending the incline A B, by its own gravity, until, as before observed, on arriving at B, it would attain the same velocity as it would have attained at T, had it fallen perpendicularly from A to T; and if locomotive power were constantly employed to assist this force of gravity, the progress of a body down the descent would be the result of these united powers; the motion would be *uniformly accelerated*, and although the velocity would be increased in proportion to the increased power employed, yet the descent would be in proportionate accordance with the laws of falling bodies, both as to spaces and times.

"3. But we will now suppose the same carriage, W, to be propelled from a state of rest at B, to the position on the incline B E, described in the diagram. The angle F E B being equal to the angle F A B, and the line of gravity, C G, being drawn, the parallelogram, C D G P, is exactly equal to that described on the descending plane; consequently, C P is the line representing the amount of pressure on the rails, and C D the line of power opposing such pressure; from which it is evident that, unless prevented by some greater power than C D, the carriage would roll back to B, but if opposed by any regular and greater power, which we will call locomotive power, the carriage would rise gradually up the plane B E, with uniform velocity, and through equal spaces in equal times; for the power C D, which is a portion of the force of gravity represented by C G, *being opposed by a greater power* than itself, does not in this case act as *an uniformly retarding power*, but as *an uniformly opposing power*. It will also be seen, that, throughout the ascent, the pressure upon the rails, and, consequently, the amount of friction, is precisely the same as it was down the descent A B, viz. as much less than it was on the horizontal line E A, as the line C D to D G.

"4. But to prove the advantage to be derived by an undulating railway, we must not allow the carriage to stop at B; we will therefore suppose it to travel as far as it is able, by gravity alone, along the undulated line A B E.

"Now, as before observed, it would descend from A to B, according to the laws of falling bodies, at which point it will have attained its greatest speed, and, consequently, its greatest momentum, and it is evident that it will rise the ascent B E, as long as the force of momentum is greater than the force C D; but the instant such force of momentum, which in this case is *an uniform retarding force*, becomes less than the force C D, the latter would effectually operate, and the carriage W would roll back, and finally settle at the point B.

"Supposing, however, that the momentum gained by the descent to B, be suffi-

cient to advance the carriage as far up the ascent as the point H,—it is evident, that, could sufficient power be *then* employed to overcome C D, the ascent H E would be made in much less time, with fewer revolutions of the wheels and axles, and with much less expense of power, than it would require to move up the whole ascent B E, as stated in position 3.

"We will now suppose that an assistant power, equal to the available power C D, be employed to propel the carriage, W, along the undulation A B E, and that such power were withdrawn at the point B,—it becomes evident that, as *gravity alone* enabled the carriage to rise the ascent as far as H, which is more than one-half of the whole ascent, now that double power is employed, double momentum at the point B will be the result; and the power C D will thus effectually be opposed up the whole ascent B E. If this be true, how much more effectually will the power C D be counteracted if the assistant power be continued up the whole ascent B E!

"From this reasoning, it appears to me indisputable, as decidedly proved by experiment, that not only can a given load be conveyed along a curved line in *very much less* time than upon a horizontal plane, or *a very much greater weight* in the same time, but that loads which no locomotive power could move on the horizontal plane E A, would, impelled by gravity, assisted by other active power, descend down A B, and rise the ascent B E, with facility; and it will be also evident, that whatever power may be left on arriving at the point E, will be the power of ascending the farther incline E I; to which surplus must of course be added, the continued active power employed to oppose C D.

"5. It must be remarked, that although the disposable *power* of gravity, in opposition to pressure, is only as C D to C P, yet this is no criterion of the extent of advantage gained in speed; in fact, C D may as properly be stated to represent the saving in friction: in whatever light, however, it may be viewed, C D represents a *constant* and *equal* power throughout the whole descent; but the spaces passed over down that descent, in consequence of such power, are *not* equal in equal times, but, owing to accelerated velocity, as the squares of the times. Supposing, for instance, A V to be 10 yards, and the carriage was 1 second in reaching V, and allow the same space to be travelled over on the horizontal plane in the same time, at maximum velocity,—now, on the latter, the carriage would travel 30 yards in 3 seconds; but down A B it would travel 90 yards in 3 seconds; because $3 \times 3 \times 10 = 90$; and this **velocity, although retarding** up the ascent, if assisted by an equal power to that employed on the horizontal plane, would be so kept up as to arrive at a given distance in far less time than it could do with an average load on the horizontal plane. Supposing, for instance, the horizontal line E A were 175 yards long, the descent A B 90 yards, and the ascent B E 90 yards, making the undulating line 180 yards, and that locomotive power were employed sufficient to overcome the friction and the resistance of the atmosphere on both lines, and to move a carriage along E A, at maximum velocity, 10 yards per second: it is obvious, that the time required to travel from E to A would be $17\frac{1}{2}$ seconds; because $\frac{175}{10} = 17\frac{1}{2}$.

"Let us now apply the same power to the same carriage travelling along the undulation A B E, and take 10 yards as the space travelled over in the first second down the descent A B: it is obvious, that it would reach the point B, or, in other words, traverse the 90 yards represented by A B, in 3 seconds; because, according to the laws of descending bodies, $3 \times 3 \times 10 = 90$. This being admitted, and even presuming that the power employed up the ascending part of the undulation, were *only just* sufficient to *overcome* the friction and resistance of the atmosphere, the carriage would naturally, as proved by the action of the pendulum, rise the ascent B E in the precise time it occupied in traversing from A to B. Hence, if a given power be employed, sufficient to overcome the friction and resistance of atmosphere, and to impel a load ten yards in the first second, upon an undulating line, such as A B E, 180 yards in length, the whole distance, if the power be constantly kept up, will be traversed in *less* than 6 seconds; whereas, if a given power be employed, sufficient to overcome the friction and resistance of atmosphere, and to impel a load 10 yards in the first second of time, *at maximum velocity*, upon a horizontal line, such as E A, 175 yards in length, the whole distance cannot be traversed in less time than $17\frac{1}{2}$ seconds. Thus, if we ascertain the maximum velocity at which a body can be impelled upon a horizontal line *in the first* second, and down the descending part of a given curve in the first second, such power being sufficient to overcome friction in both cases, the comparative time occupied in traversing each distance is easily determinable; the difference in advantage varying in proportion to the length and depth of undulation, as compared with the length of the horizontal line. Nor must it be overlooked, in considering this sub-

ject, that a much greater load can be conveyed along an undulating line than along a horizontal one. The axle and rolling friction to be overcome is necessarily less upon the former than upon the latter, and the fulcrum presented to the effective power of steam, down the descending part of each undulation, is a most important object of advantage. It will be seen, that in this explanation I have calculated the velocity of a body traversing a curve, according to the laws which would govern its descent down a regular inclined plane; there would of couse be some difference, but in this instance it cannot be material to describe it."

In an appendix to the treatise, two letters are given from Mr. Robert Stephenson, senior, to Mr. Badnall, in which Mr. S. fully admits the superiority of the undulating railway over the horizontal one, and is at some pains to account for it on practical grounds. He concludes with expressing an opinion, that it "will require even a longer railway than the Liverpool and Manchester one, to prove the extent of its value."

Stamping of Metallic Ores.—Sir, In the last vol., page 416, one of your correspondents wishes to learn, through that means, "if any improvement can be made in the stamping of metallic ores, or power added to a water-wheel, whereby the work doing by a small stream of water may be doubled?" I should say the way to improve the power of the wheel is by adding height or diameter to it (if the situation will allow it). Because a water-wheel is a lever, and the longer that lever or arms of the wheel are, the more powerful is the weight applied on the ends of them. Water-power is the very best, where a regular stream is certain. If the stream of water is small, the wheel should be proportionably higher. If a wheel 12 feet high works ten heads of stampers, another wheel 20 feet in height will work twenty heads of stampers with the same stream of water upon it. In the same way and proportion power may be gained to any height required. But 60 feet high is quite high enough for any water-wheel; when higher than that, it becomes a cumbersome machine. At Swinny, on the River Severn, three miles below the Iron Bridge, in Shropshire, there is a wheel at work 82 feet high. But it cannot be allowed to stand at all, any time together; for if it were to stand long, the part down would become quarter heavy.—I am, yours obediently, THOS. DEAKIN, Blaenavon, April 15, 1833.

Amianthus Cloth.—Madame Lena Carpenti, of Como, used formerly to weave amianthus cloth. The amianthine fibres are mixed with flax, cotton, or silk, and thus woven together. The cloth is then cast into the fire, which leaves the amianthus untouched and consumes the rest. Fine specimens of amianthus are obtained in Corsica, soft and silky, the fibres of considerable length. I possess a singularly beautiful specimen from that island. The amianthus is previously exposed to the action of the steam in a vessel which will contain 3,000lbs. of the mineral; by these means the fibres become flexible and are easily separated; the individual fibre is as fine as silk, and generally about four inches long.—*Murray's Practical Observations on the Phenomena of Flame and Safety Lamps.*

New Motive Power.—Dr. Ritchie, in one of his recent lectures on electro-magnetism, at the Royal Institution, proved by experiments that by suddenly changing the poles of an electro-magnet, a bar of soft iron might be made to revolve with considerable force about its centre, thus obtaining a prime mover which may probably be applied to useful purposes.

Grand Junction Railway.—The Act for this railway, which is to unite the Liverpool and Manchester with the Birmingham railway (see Mech. Mag., March 3, 1832) has passed through both Houses without opposition, and received the royal assent at the same time with the Birmingham Railway Act.

The Factory System.—Mr. Malyn, the author of some papers on this system, lately read before the Westminster Medical Society, contends that it is of necessity so utterly destructive "of mind, body, and morals," that it should at once be put an end to, even "though towns should be razed and trade annihilated." But if no trades are to be tolerated which are destructive of mind and body, where are we to stop? If our cotton factories were to be abolished on this ground, how could we think of keeping open our coal mines? And if we had no coal, what would become of all those arts which minister to our comfort, happiness, and civilisation? Sentimentalists who reason like Mr. Malyn, take a very contracted and absurd view of human society. Scarce a single branch of labour can be named which is not *unavoidably*, more or less, unfavourable to health and to mental cultivation. The utmost that a judicious philanthropy would aim at accomplishing is to reduce as much as possible the amount of that "partial evil" which is the appointed condition of every thing in the nature of "universal good."

How to remove Spots from Mildewed Stuffs.—Mix two ounces of ammonia in two pounds of water; immerse the cloth in this solution for five minutes, and then rinse in clean water.

INTERIM NOTICES.

The Supplement to Vol. XVIII., containing Title, Preface, and Index, with a Portrait on Steel of Professor Babbage, engraved by permission from an original Family Painting, is now on sale, price 6*d*. Proof copies on India paper of the Portrait, price 2*s*. Also Vol. XVIII. complete in boards, price 8*s*.

"A Friend to Science" has put us to the expense of a postage to make an inquiry of no public interest whatever.

Communications received from T. M. B.—ϕ. μ.—P. R.—J. E.—Mr. Bevan.

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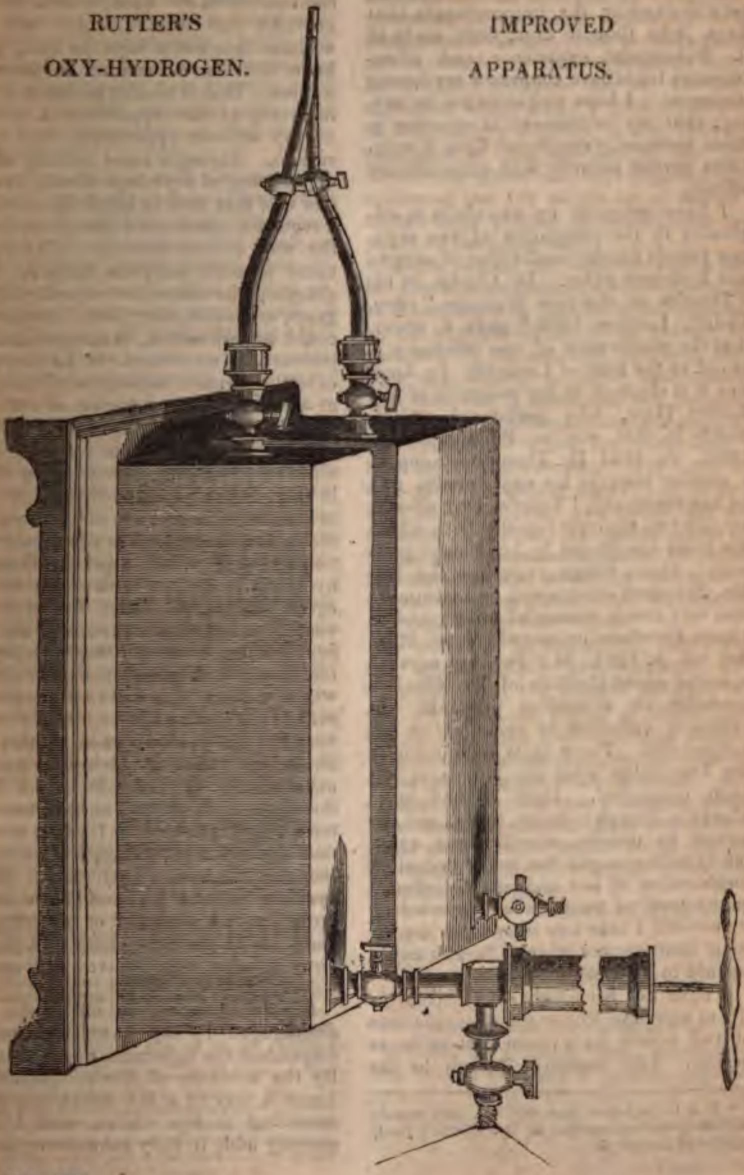
No. 510.] SATURDAY, MAY 18, 1833. Price 3d.

RUTTER'S IMPROVED OXY-HYDROGEN APPARATUS.



RUTTER'S IMPROVED OXY-HYDROGEN APPARATUS.

Sir,—Five months have elapsed since I sent you an account of an oxy-hydrogen apparatus I had caused to be constructed for my own use, and which I considered very superior to Clarke's instrument, notwithstanding the improvements that have, from time to time, been made in it. Subsequent experience and often-repeated trials have confirmed my former statement. I have no hesitation in saying, that my instrument is superior to those commonly employed, since it combines perfect security with extraordinary efficacy.

I have never set up any claim to originality in the adaptation of two separate vessels for the combustion of oxygen and hydrogen gases. Dr. Clarke, in his "Treatise on the Gas Blowpipe," 8vo. Cadell, London, 1819,* page 6, states, that the contrivance of two reservoirs is as old as the time of Lavoisier. In America it is claimed as the invention of Mr. Robert Hare, who performed experiments in this way at Philadelphia in 1802. In 1801 Dr. Thompson adopted a similar plan for his experiments, and he has continued, I believe, ever since to employ two separate vessels, from which the gases are ejected by hydrostatic pressure. About fifteen years ago the late Mr. Sylvester constructed an instrument that very much resembled mine; and as I have elsewhere intimated (Mech. Mag. last vol. p. 172), Mr. Faraday says he saw one about the time of Dr. Clarke's invention on a similar principle, but evidently defective in some of its arrangements. These facts have come to my knowledge *since* my apparatus has been completed. Until I had used Clarke's blowpipe many times, and observed its danger, should some apparently trifling conditions be neglected or forgotten, or by any accident disturbed, I gave myself no trouble about superseding it, nor did I take any interest in the various contrivances which Clarke's might be said to have originated.

I have not been able very satisfactorily to ascertain why so many adaptations of two vessels have been cast aside as useless. The nearest approach to the causes of failure seems to be in the construction of the tubes by which the gases were conveyed from their respective reservoirs. These tubes, it appears, were kept separate to within an inch or two of the point of the jet, but previously to the gases entering into combustion they were united in one common exit tube. I am not sure whether this was always the case, but I know it to have been so in many instances. That it readily accounts for the inefficacy of the apparatus, I can testify by my own experiments and observations. Through some trifling misunderstanding of my rough sketch, the parties who first took in hand the apparatus I required, constructed the tubes just in the way I have described. Never was there a more complete failure. After charging the respective vessels with the gases, and submitting them, as nearly as could be calculated, to an uniformity of pressure, it was found to be impracticable to regulate the escape of the gases at the jet with any degree of certainty. Oxygen and hydrogen gases, differing very materially in density, they differ also in a somewhat corresponding degree in their habits. I found that the oxygen, in the first instance, cut off the egress of the hydrogen, and when the greater portion of oxygen had escaped, then the hydrogen in its turn resisted the further egress of oxygen. I had the most convincing proofs of this alternately counteracting force, inasmuch that a retrograde movement took place in each tube, by which mercury was driven through a *so called* safety-valve into both of the copper vessels. The consequence of this was an amalgamation of the solder, and the unsoundness of the vessels. I have, therefore, been obliged to have new bottoms adapted to them. I ought to state, that the orifice of the jet I used on this occasion was exceedingly small. If the aperture of the jet had been larger, probably the difficulty of ejecting the gases would not have existed. I proved, however, that safety-valves are not always safe.

Somewhat vexed, but not in the least discouraged by my want of success, I dispatched the apparatus again to town. By the kindness of Messrs. W. and S. Jones it was in a few weeks completed according to my wishes, and I need scarcely add, it fully answers my expec-

* It is to regretted that this is a very meagre and unsatisfactory account of Dr. Clarke's justly celebrated invention.

tations. An apprehension lest by any possibility an interchange of the gases could take place determined me to have, in the first instance, a safety-valve to each tube. This seemed only a necessary precaution, whilst the gases met in one common exit as before stated. The safety-valves were afterwards abandoned, because wholly unnecessary. In its present form, I believe, the distinguishing feature of my apparatus is, that the gases are kept perfectly separate until they escape from the orifices of their respective tubes.

I know it will be said (indeed it has been said, by men to whose opinions and judgment I ought to bow with every demonstration of respect), that the heat exhibited by the gases, under these circumstances, is not so great as that resulting from their union in one vessel. I have yet to learn of what advantage it is to unite the gases in one vessel, excepting that the just proportions are perhaps more easily obtained, and a uniformity of pressure preserved. We know well that the gases, when compressed in one vessel, mix only mechanically. No chemical combination ensues until they are ignited, and it is to their combining chemically, under these circumstances, that we are indebted for the exalted temperature that is developed.

Reserving to myself the right to think as I please at present, and to judge according to the evidence of my senses in this matter, suppose, after all, it could be proved that the heat elicited from the gases in separate vessels were inferior to that arising from their union in one vessel, yet, I would ask, if all the usual experiments adapted for the lecture-room can be performed in a way that ensures perfect security to the operator and to his audience, why should we take thither an instrument that is acknowledged to be exceedingly dangerous?*

That all the usual experiments can be performed with my apparatus, and with an effect incomparably more brilliant and impressive than with Clarke's, has been proved many times. My chief anxiety is to remove from the public lecture-table an instrument whose employment is manifestly attended with considerable danger, and to place there in its stead one that is perfectly safe. In Clarke's blowpipe one of the conditions on which security from explosion in some degree depends, is the extreme smallness of the aperture of the jet. When the gases are kept separate the calibre of the jets might be of any required size, without detracting from the safety of the apparatus.

There can be no objection to the use of Clarke's or Gurney's blow-pipes, or of Hemming's or Daniell's safety-tubes, by the experimentalist in his private researches. I do not find, however, that men are willing to incur unnecessary risk, nor can I think they are justified in doing so. When life and health, and the exercise of talent, are concerned, a man has no right to ask, "May I not do as I please with my own?" It is our duty to adopt every precaution that we conceive tends to the preservation of health and the prolongation of life, and it behoves us also to employ our talents so that we may glorify God, and confer a benefit on our fellow-men.

I wish it to be understood, that I am not contemplating any pecuniary advantages from the general diffusion of the apparatus, of which a friend has kindly taken the accompanying sketch. It must be apparent that, in this respect, I can never turn it to any account. My own instrument has cost, I suppose, more than three times as much as a duplicate could now be made for. This is one of the inconveniences to which projectors must quietly submit.

J. O. N. RUTTER.

May 9, 1833.

* "It (Clarke's blowpipe) always, however, remains a dangerous instrument!"—Brande's Chem. vol. i. p. 166.

"It is a prudent precaution to place a wooden screen between the box (Clarke's blowpipe) and the operator!"—Ure, Dict. Chem., Art. Blowpipe.

"Those only can be considered perfectly safe where the reservoir of gas, as in Dr. Clarke's arrangement, is separated from the operator by a wall or partition of strength sufficient to give full security!"—Faraday's Chem. Manip. p. 123.

"The danger attending the employing of Clarke's blowpipe, notwithstanding the alterations of Professor Cumming and others, still remains such as to deter all but a few bold experimentalists from the use of it."—Griffin on the Blowpipe, p. 32.

WINES AND SPIRITS.

Gin.

(In continuation from last vol. p. 412.)

Proof is an arbitrary term, descriptive of a certain standard of specific gravity, by which the relative strength of spirits is calculated, and the duties charged thereon. By Act of Parliament the specific gravity of proof spirit, at the temper-

ature 60° Far., is fixed at 916. In commercial transactions it is usually somewhat lower than this; 920 perhaps might be taken as a fair average. Proof spirit consists, therefore, as near as possible, of a mixture in equal proportions of water and the strongest alcohol that has been hitherto obtained.

Gin, and other British compounds, cannot legally be sold at a greater strength than 17 per cent. under proof; 22 per cent. under is the strength at which the greater portion of raw, or, as it is technically termed, "strong gin," is sent out by the rectifiers to their customers. Plain British spirits may be sold at any strength not exceeding 25 per cent. over, or 17 per cent. under, proof. Over proof denotes, of course, a spirit that is stronger than proof; under proof is the reverse of that. In over-proof spirit it is understood that a certain quantity of water must be added to the spirit to reduce it to proof. Thus, 100 gallons at 25 per cent. over proof will require 25 gallons of water to reduce them to proof, making in the whole 125 gallons. With under-proof spirit, although the process is the same, the result is somewhat different. If it be required to reduce 100 gallons of proof spirit to 22 per cent. under, there must be added of water, not 22 gallons, but rather more than 28 gallons. The reason for this can be easily explained, but we will not go into it at present. To make it more apparent let us suppose that it is necessary to reduce 78 gallons of proof spirit to 22 per cent. under; add 22 gallons of water, and there will be 100 gallons of spirit at the required strength:* 22 per cent. over proof signifies, therefore, that 22 gallons of water has been evaporated from 122 gallons of spirit at proof, leaving 100 gallons of concentrated spirit; 22 per cent. under proof denotes 22 gallons of water added to 78 of spirit at proof, making 100 gallons of diluted spirit.

The specific gravity of spirits, or in other words their strength, is ascertained by an instrument termed an hydrometer. Its name is compounded of two Greek words signifying to measure water. The hydrometer, as improved by the late Mr. Sykes, is that exclusively employed by the Boards of Customs and Excise. The hydrometer supplies the necessity for weighing specimens of spirits, and estimating their strength by a comparison with an equal bulk of distilled water. Its indications are sufficiently accurate for all practical purposes. The admixture of sugar, either as sweetening or colouring, with spirits, affects the indications of the hydrometer, giving to the specimen an increase of density, and consequently diminishing, apparently, its strength. Hence the strength of gin or other spirits, when sweetened, cannot be estimated by the hydrometer.

There are no legal restrictions relative to the strength at which British compounds may be sold, excepting that they must not be stronger than 17 per cent. under proof. We need have no fears in these "sugar and water" times that the law will be violated. The great concern of some is not how strong gin *may* be, but how weak it *can* be sold. The price of strong gin, that is gin to which has not been added either sugar or flavouring ingredients since it was drawn from the still, varies but very little. It differs in flavour, since every rectifier apportions the ingredients according to his own taste and judgment. The respectable London rectifiers of the present day, although they may employ different means, generally arrive at the same result in producing a gin that is exceedingly pure, wholesome, and agreeable. The rectifiers, as a body, must not be held responsible for the aromatic trash, whose extraordinary properties are so energetically dwelt upon in newspapers and other vehicles of information. It would be quite as reasonable to make the College of Physicians answerable for the tricks of empirics, and the diseases occasioned by certain wonder-working pills, as to charge to the account of the gin manufacturers all the mischiefs that accrue from a compound whose general denomination is gin, but among whose elements gin can scarcely be recognised.

To prevent any cavilling about price in the following calculations, and with a view to provide for freight or carriage to a distant part of the empire, we will assume that strong gin, 22 per cent. under proof, costs the dealer or the retailer

* This is not literally the case, inasmuch that a diminution of bulk ensues by the admixture of water with spirits. If 30 gallons of water be intimately blended with 100 gallons of spirit, say 30 per cent. over proof, there will not be 130 gallons, but about 129. It is a species of condensation. A more appropriate term, perhaps, is penetration. It implies the capacity of water for alcohol, or *vice versa*.

10*s.* per gallon. The dealer, or retailer, who is content with a moderate profit, charges this gin, say, from 11*s.* 6*d.* to 13*s.* per gallon, and in that case it ought not to be either reduced or sweetened. But there are some customers who must have cheap gin, and 10*s.* per gallon is the utmost they will consent to give. Here commences the cordialising system. These cheap gin customers must be supplied, and to do so the gin at 22 per cent. under must be reduced to 35 or 40 per cent. under, the former costing the dealer 8*s.* 4*d.*, the latter 7*s.* 8½*d.* per gallon, and still yielding him a good profit, viz. 20 and 30 per cent. respectively. It may be, however, that the dealer or retailer may have no great regard for moderate profits—he may have no fear of sugar and water before his eyes; and further, he may have some good customers for "most delicious" cordial gin at 8*s.*, or 6*s.* 8*d.*, or 6s. per gallon. Moreover, it may be found that advertising and placarding, and painting and gilding, and building houses and erecting vats, are all expensive operations. How can it be managed to "make up" an "inestimable" gin, that shall yield a good profit at the above quoted "astonishingly low" prices? Nothing can be easier than the accomplishment of this to the initiated. The gin at 22 per cent. under, and costing 10*s.* per gallon, must be reduced to 50 per cent. under to sell at 8*s.* per gallon; that for sale at 6*s.* 8*d.* per gallon must be reduced to 60 per cent. under; and that intended for 6*s.* per gallon must necessarily undergo a further reduction to 65 per cent. under. We shall now have gin and water, &c. &c. &c. at the following strengths and prices:—

50 per cent. under, costing	6*s.* 5*d.*	per gal. sells for	8*s.* 0*d.*	profit	25 per cent.
60 - -	5*s.* 1½*d.*	- -	6*s.* 8*d.*	-	30
65 - -	4*s.* 6*d.*	- -	6*s.* 0*d.*	-	32½

These are intended as specimens. It will easily be seen that by a greater reduction of strength a greater rate of profit will be obtained. Water is quite sufficient for reducing the strength of gin; but we shall be greatly mistaken if we imagine that water is employed alone in effecting these successive changes. Sugar is to the "maker up" of gin what mercury is to the quack doctor. From 20 to 45 lbs. of sugar enter into the composition of every 100 gallons of the "delicious" and "full strength" mixtures we have above described.

If water and sugar were the only additions to the gin, perhaps, after all, there would be no very good cause for complaint. If people will buy sweet gin and water, instead of gin, surely they have only themselves to blame. Every successive reduction of the strength of gin by water necessarily diminishes its flavour, and every additional lb. of sugar added to the diluted spirit tends also to conceal that flavour. Hence it is found necessary to have recourse to what is termed "cold flavouring." Cold flavouring is a compound whose various elements are in most cases too numerous to mention. In some cases they are too bad to be mentioned. I shall not even hint at them here, having already stated my objections to that course.

Sugar and flavouring have no need to be reckoned in the cost of the gin. These articles not only pay for themselves, but they generally yield a profit of from 20 to 50 per cent.

In a mixture consisting, as we have seen, of about 2 gallons of proof spirit and 4 gallons of water, with sugar and flavouring, it is not difficult to conceive that alcohol will not particularly predominate. The extraordinary dilution of spirit must, therefore, as much as possible, be carefully concealed, and the place of alcohol be supplied by some other aids. Herein consists the worst part of the cordialising process. Acrid and astringent substances are concentrated, their finer particles diffused throughout the previously heterogeneous liquid, and thus is given the finishing stroke to a widely diffused and much too successful system of imposture.

It might naturally be inquired, is all cordial gin thus prepared? No, certainly not. There is cordial gin whose flavour is exquisite, and whose properties are both healthful and cheering; but the use of cordial gin is in itself an evil, for it implies a vitiated taste, and a desire for spirits that are ostensibly undiluted.

The ill consequences attendant on the unrestricted use of ardent spirits in populous towns, and especially in the metro-

polis, are too manifest and too appalling to be either concealed or denied. It is an evil that is daily becoming more frightful; and if ever a legislative enactment were needed to check the torrent of dissipation and squalid misery that sets in upon our thickly populated districts, it is needed now in reference to the duties on British and Colonial spirits. The products of the earth, in their primary and simple forms, should not be encumbered with prohibitory duties whilst they remain on the soil from whence they originate. When converted into articles of luxury these products become legitimate objects of taxation. The use of spirits is in itself good, and under certain circumstances beneficial. It is the abuse of which we justly complain. The present system of "making up" gin contributes very materially to the iniquitous practices that stand associated with its unrestricted use: would not, therefore, an increase of duty be desirable? If the free use of gin, or rather of a compound called by that name, tends to the developement of the worst passions of our species, surely the gratification of such propensities may jusly become an object of taxation.

I fear this paper has been extended beyond its proper limits. I have only one remark more to offer, and that relates to the profits arising from cheap gin. Supposing the price of a certain "made up" gin to be 8*s.* per gallon, and the "glass" price be fixed at that ratio, the profit by short measure will be equal to 30 per cent. In handing gin to the counter it is apparent the glass or measure cannot be quite full. The deficit is clear gain to the retailer; and if in its transit to the lips of the purchaser there be a little thrown over on the counter that also adds to the gains by being replaced in the cask. The time was that by drinking a few glasses of undiluted spirits men were speedily stricken down in a state of drunken insensibility. Now it is otherwise: men, women, children, drink glass after glass. The more they drink the greater is their thirst for more, until glasses give place to half-pints and pints, and then follow those loathsome and abhorrent scenes, that the mind cannot revert to without sorrow and indignation.

IN VINO VERITAS.

May 8, 1833.

THE ENTERPRISE STEAM OMNIBUS.

Sir,—I hand you for insertion a continuation of the performance of the "Enterprise Steam Omnibus:"—

<table>
<tr><th></th><th>Miles.</th><th>Total Time.</th><th>Delays.</th><th>Travelling.</th></tr>
<tr><td>April 29, from City-road to Paddington and back</td><td>8½ —</td><td>51′ —</td><td>5½′ —</td><td>46½′</td></tr>
<tr><td>30, - - - - -</td><td>„ —</td><td>51 —</td><td>6½ —</td><td>45</td></tr>
<tr><td>May 1, from City-road to Paddington, thence round Finsbury-square, and back to City-road - -</td><td>10 —</td><td>78 —</td><td>15 —</td><td>63</td></tr>
<tr><td>2, - - - - -</td><td>„ —</td><td>67 —</td><td>9 —</td><td>58</td></tr>
<tr><td>3, - - - - -</td><td>„ —</td><td>79 —</td><td>18 —</td><td>61</td></tr>
<tr><td>4, - - - - -</td><td>„ —</td><td>70 —</td><td>12½ —</td><td>57½</td></tr>
<tr><td>6, - - - - -</td><td>„ —</td><td>65 —</td><td>8 —</td><td>57</td></tr>
<tr><td>7, from City-road to Paddington, round Finsbury square, and thence to Paddington, where the welding of the centre of the crank-shaft gave way; put on a collar, and returned to City-road.</td><td colspan="4" rowspan="3">At the former average speed.</td></tr>
<tr><td>8, from City-road round Finsbury-square, and thence to Paddington; put in new fire bars.</td></tr>
<tr><td>9, from Paddington to the bottom of City-road, returned to Paddington, and back to City-road.</td></tr>
</table>

This journey concludes, for the present, the first series of operations of the "Enterprise," as stated in my last.

I expect to have one of my own carriages running daily in the course of the ensuing month, and a second in the month following, and trust that during the summer not less than four will be running in the neighbourhood of town, and that their performance will ensure to this mode of transit the patronage of the public.

I am, Sir, your obedient servant,
W. HANCOCK.

Stratford, May 13, 1833.

MEASURES OF CAPACITY USED AT COVENT-GARDEN MARKET.

Sir,—It will be thought a little remarkable that several of the measures in daily use at Covent-garden market, and which are frequently mentioned in the periodical prices of articles sold in that market, should be so little known in the country. I have occasionally inquired at different parts of the country among gardeners and those who cultivate vegetables on a large scale, whether they could inform me of the dimensions and capacity of the sieve and the punnet, or what relation these measures bear to the imperial bushel, but in all my inquiries I met with disappointment. To obtain this information for myself and others, I purchased a new set of these measures of one of the principal vendors in the market, and have ascertained their capacities, heaped measure, as follows:—

The sieve contained	1,644	cubic inches, or about		$\frac{3}{4}$ bushel.
half sieve -	822	-	-	1 peck.
quarter sieve	362	-	-	1 gallon.
punnet, largest	248			
ditto, second	228	-	-	1 pottle.
ditto, third -	90	-	-	1 quart.
ditto, smallest	60	-	-	$1\frac{1}{3}$ pints.

The above table may serve to shew nearly the quantity sold under these respective denominations; of course it will depend upon the manner of heaping and filling them.

Until, therefore, any person will take the pains to publish more correct information on these measures, the table above may enable country gardeners and dealers in vegetables, when they read the report of Covent-garden prices, to understand what relation the London prices bear to those in the country.

There are some articles usually sold by the *bunch*. If any of your London correspondents will but take the trouble to ascertain the medium weight of these bunches, much of the obscurity so long resting upon these matters will be removed. It would also be giving very useful information if any person would publish an account of the weight, in pounds, of the quantities usually sold by the sieve, half-sieve, and punnet.

The principal object in all publications should be that of diffusing useful information, and every person who has from the commencement perused the Mech. Mag., must be convinced that its editor has contributed very largely to extend the bounds of useful knowledge. I hope in this instance the invitation hereby given will not be passed over and neglected, but that one of your London contributors will favour the public with the information required.

I am, Sir, your's truly,
B. BEVAN.

Leighton, May 8, 1833.

THE COINAGE.

Sir,—In p. 431 of your No. 503, I observe a scheme with respect to money as a medium of exchange.

It appears to me that the greatest inconvenience in our present money is the size of our copper coins, and the very unpleasant smell of them. I would propose that some other metal or mixed metal should be used instead of copper, which is dearer and not so disagreeable in the smell.

Ten is a useful number in large sums, but 12 is a more useful number to divide into small sums. Thus, 12 divides by 2, 3, 4, 6; and 10 only by 2 and 5, without a remainder. And these, again, by 1, 1, 2, 3.

A silver coin less than sixpence would be inconveniently small; but a metal four times dearer than copper would form a very convenient medium of exchange; our pence would then be only the size of our present farthings.

I am, Sir, yours, &c.
J. M. Corbett.

Salop.

THE TRIUMPH STEAM-CARRIAGE.

Sir,—"Saxula" has named his carriage the "Triumph;" but I shall not consider the triumph complete until he has run it daily for six or twelve months on a common road, and given an accurate statement of the costs arising from wear and tear, fuel, attendance, and interest of capital. It is no proof that the anxiously-desired object has been attained,—of running steam-carriages on common roads,—because a carriage has been constructed that will run a certain distance, at a certain rate, with a certain number of passengers or tons of merchandise. Many important undertakings have proved splendid failures, simply, as I conceive, on account of the conditions implied in their principle being imperfectly understood, or totally neglected. The necessary conditions for locomotive carriages on common roads may, I think, be clearly ascertained by a careful attention to those employed on rail-roads. If the published statements in reference to the engines at work on the Liverpool and Manchester rail-roads are to be credited, it appears that, with friction and abrasion at a minimum, those engines involve a prodigious outlay of capital in their original construction and in their subsequent repairs. Now, supposing it should be found advisable to go to a considerable expense in the construction of any future rail-road, either in polishing it, or in having a double line of road, each inclining throughout its whole length, but in opposite directions; and if by these or any other arrangements it should be found that the first expense of engines and their subsequent wear and tear would be thereby reduced, should we be any nearer than we are at present to turnpike-road engines? I rather think we should be farther off than ever. On rail-roads, the friction, the agitation, and the consequent abrasion of surface, are found to be the chief impediments to success. How, therefore, can we expect to succeed, where we have to contend with more friction, more agitation, more abrasion, and, last but not least, inequalities of surface, which do not exist on rail-roads? Far be it from me to think or say that the object is unattainable;—many more unlikely things have happened, and will doubtless continue to do so almost every day. But we never can move safely towards a result until we thoroughly understand the principles of our experiment, and make ourselves conversant with its conditions. I wish "Saxula" success, and I sincerely hope he will favour your readers, from time to time, with the data he obtains in his experiments on this interesting subject.

J. O. N. Rutter.

April 18, 1833.

Hot-water Pump.—Sir, I beg to refer the Subscriber, page 65, who wishes to be made acquainted with a mode of ensuring an uninterrupted supply of hot water, to the plan of a hot-water pump, which you did me the favour to insert in your valuable Journal of the 13th April last. Having tried that plan myself, I can assure him of the perfect success of its action. I imagine that the circumstance of his plunger-pump generating steam instead of forcing in water, does not arise from the action of the plunger, but from some slight leakage of the valve in the pipe leading from the pump to the boiler. It may be *water*-tight, but yet not *steam*-tight. Now, as the pump is placed 15 feet from the water, the sucker-pipe will of course be filled with vapour or steam before the water rises; and whatever the bore may be, this 15 feet column of steam will in some measure resist the pressure of the atmosphere on the water in the tank, and thereby diminish its effect. Should your correspondent still have any difficulty with his apparatus, if he will state the exact dimensions of the different parts, I will endeavour to illustrate the matter somewhat further, either (by your permission) through the medium of your pages, or by private correspondence.—I remain your obedient, G. M.
April 30, 1833.

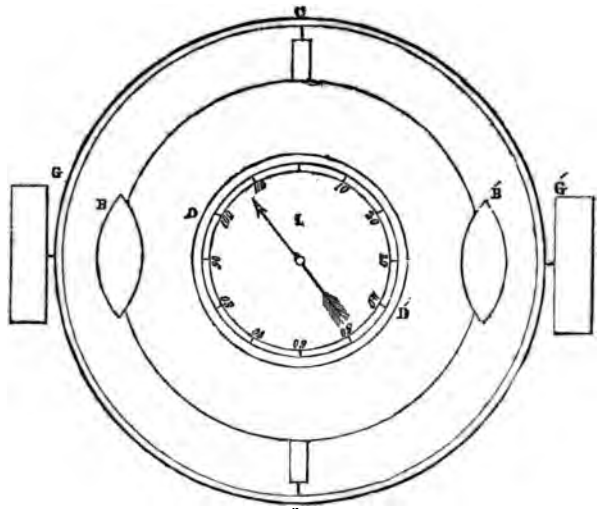


Fig. 1.

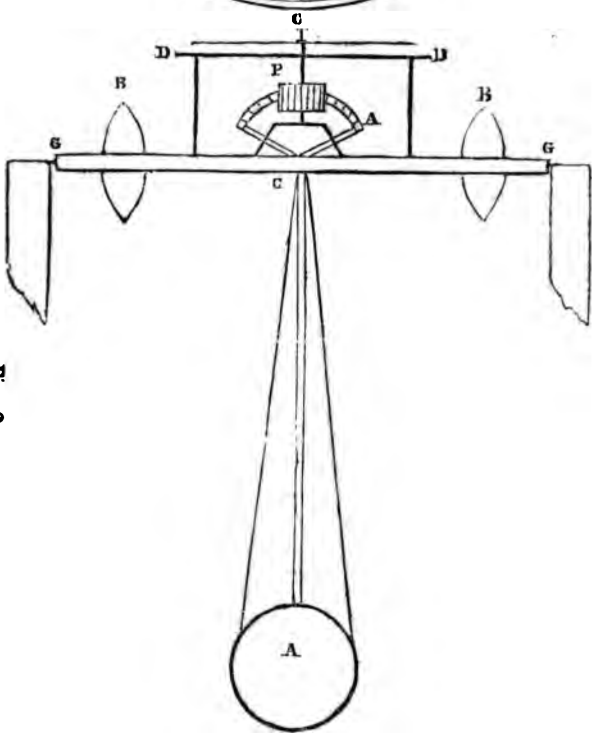


Fig. 2.

INSTRUMENT FOR MEASURING A SHIP'S PROGRESS AT SEA.

Sir,—The prefixed sketches represent an instrument for measuring the rate of a ship's progress at sea. Fig. 1 is a downward view, and fig. 2 a front view.

The principle of the invention is this, that if a plummet be free in a ship it will not hang truly perpendicular, except when she is at rest from rectilinear motion; but that it will, on the contrary, when she is in motion, hang out of the perpendicular at an angle always proportionate to the velocity of the motion. It is only required, therefore, to render this angle subject to observation, and we have the most unerring of all means of estimating that velocity. To do this I combine what are, in fact, two plummets, one horizontal, the other perpendicular; they are hung upon gimbals, so as to be independent of the rolling and pitching of the ship, and also of each other, though the beam of the horizontal one and the rod of the perpendicular one intersect. Thus in fig. 2, A is the perpendicular plummet, ending at A′ in a toothed arc; the ends of its axis are seen at C coming through the outer gimbal ring GG′. B and B′ are the balls of the horizontal plummet; they are fixed on the circumference of a circular plate, the intervening diameter of which may be considered as the beam connecting these balls. I use the word beam, because, as will be more particularly noticed, they are precisely in the condition of a balance. The outer gimbal ring conceals this plate in fig. 2, but it is shown in fig. 1. Because of the position of these balls, and of their opposition, the plate will always be truly horizontal. The horizontal plummet thus constructed is hung on the axis of the perpendicular one, so as to move freely upon it, and so more especially as to have the centre of gravity a little below the points of suspension, just as the beam of a common balance is hung. An index plate DD′ is supported by pillars on the horizontal plate, and an index I is connected by means of a pinion P with the toothed arc. When the ship is stationary, if she commence to roll or pitch, or to do both, the horizontal and the perpendicular plummets act and move in strict unison, and the index continues unaffected; but as soon as the ship commences to make head or stern way, the perpendicular plummet is made to deviate in proportion from the true perpendicular, and the arc is thus made to work on the pinion, and so the index magnifies and registers the angle of deviation. *When the motion ceases, or when it is increased or diminished*, a new adjustment of the arc and pinion takes place, and a new registry is made; and by adding a piece of clockwork, a continued registry can be kept of all the changes of velocity that may occur.

To render this invention practically available, it will be only necessary by previous experiment to ascertain what angle of deviation corresponds to given velocities with a pendulum plummet of a given length; and, from what experiments I have been able to make, I am inclined to think that the deviations, even at small velocities, will be considerable with a plummet of a moderate length. This instrument should be fixed near to either the bow or stern, and in the horizontal line which passes through the centre of gravity of the ship; for if it be much above or below that line, and near the midships, the pitching of the ship will affect it as rectilinear progress would.

I hope, Mr. Editor, this will appear to you and to your readers what it seems to me, more free from error than any other means of estimate yet proposed to accomplish the same end. Among many advantages it seems to offer, there is one I should like to particularise, as I hope some of your correspondents will favour me with an opinion as to the reality of it. It appears to me, that it will not, as the other methods do, measure the surface distance over the waves in foul weather instead of the real progress made. The construction I have given is rather complex, but it possesses the very great advantage of the capability of registering all the changes the velocity may undergo. If this advantage could be foregone, the instrument might be much simplified. Thus we might omit the toothed arc, pinion and index with its plate, as also the balls BB′; and the plate which bore them might be fixed immovably on the axis of the perpendicular plummet. Lastly, there might be fixed on the plate, at right angles with that axis, a graduated spirit-level. The angle of deviation would be thus rendered very apparent.

I remain, Sir, your obedient servant,

φ. μ

May 4, 1833.

P. S.—Since writing the preceding, a new and perhaps better mode of accomplishing the object in view has occurred to me. It is as follows:—Construct two pendulum chronometers, of convenient size and perfectly similar in all respects;

suspend each on gimbals, and let one be fixed so that its pendulum may vibrate from stem to stern, and the other so that its vibration may be at right angles, or from starboard to larboard. When the ship is still, these will go together; but when she moves, they will differ, and the difference of their rates will be proportioned to the velocity of her motion. Conversely, also, an attention to the position of the common chronometers may be thus found to account for certain errors in their rates, hitherto ascribed to other causes.

ON THE UNDULATING RAILWAY.

Sir,—Allow me to point out what I conceive to be a fallacy in the assumed result of Mr. Badnall's experiments on the undulating railway.

The carriage on the plane does not arrive at its maximum velocity for some time; there is a loss of *time* at starting. That on the undulating railway arrives almost immediately at the maximum velocity, namely, when it reaches the bottom of the first descent. The greater the weight the greater will this difference be; or the longer will be the time required on the plane to arrive at the full velocity, which accords with Mr. Badnall's experiments. But when the full velocity is attained I cannot doubt that the carriage will travel farther on the plane than on the undulating line, simply because it has less surface to pass over. Now the question (certainly a very important one) may be decided, I think, by the following simple experiment:—Let an inclined plane be attached to either railway, so that a carriage, upon reaching the bottom of it, shall attain its maximum velocity, or as nearly so as may be, without any other impelling force than that of gravity. Let the carriage now run from thence on to either railway, and note the time, and space in a direct line, passed before it stops. Then the carriage will in each case *start* fairly; no other impelling power than the impetus acquired by the carriage can operate, and there can be no error of effect or mechanism. Of course the carriage must be equally loaded for the experiment on each railway. Or, if a spring be preferred to impel the carriage, it must be wound up to a fixed point for each trial, and the railways be *long enough* to permit the carriage to *run on* until it is exhausted, or the carriage stop of itself.

And here I must observe, that winding up the spring by reversing the motion of the carriage gives an undue favour to the curved railway, from its greater length and the consequent greater number of revolutions of the wheels. I would observe, further, that if the carriage on the undulating line should happen just to reach the apex of an ascent with difficulty, it should be stopped there unless the undulations be very numerous. So also should it be stopped from running back any ascent.

As the whole affair is a matter of friction—for any thing gained by any means on the descent must be lost on the ascent (or Mr. Badnall may derive from this the perpetual motion)—it would be a singular result, indeed, if the experiment be properly made, that we should find the longer to be the shorter way—the more uneven to be the easier road.

I am, Sir,

Your obedient servant,

T——s H—D.

London, May 13, 1833.

Sir,—I think the advantage shown on this railway in the experiments which have been tried, depends on the peculiar power used in moving the carriage:—the carriage moves faster down the first plane than on the level, therefore the spring unfolds faster on the undulating than on the horizontal railway, and the impetus in the spring increases in a greater ratio, it constituting a sort of accelerating force, increasing in a greater ratio in the one case than in the other. Suppose the carriage to move down the first plane, A B with the spring unwound, it will rise, say one half, up B E; there then is the whole of the momentum of the vehicle, separate from the power of the spring, which are two distinct forces, and should be held strictly so in considering the plan.

Let us see now how the spring works upon the axle of the carriage, and what its effect is on the momentum which the vehicle acquires of itself in passing from A to B. Of itself the carriage moves

down A B with an increasing velocity, and the axle recedes from the moving power with the same proportionate velocity; but when the spring is brought to bear upon the axle, it continues to act with at least as a great a force down the incline A B as on the horizontal railway; consequently the whole of the momentum acquired by the fall from A to B is in reserve in the vehicle, at that point where of itself it would begin to fail, or it is carried over to beyond the point of oscillation to which the vehicle would rise on the plane B E, without the spring.

In this view of the method employed on the undulating railway, its success is owing wholly to the moving power adapted to the carriage; for, 1st. Because the spring unwinds faster, a force is generated at the commencement of the course, which accumulates in a greater ratio than on the horizontal line. 2d. The action of the spring on the axle is continual and unremitting, whatever the velocity with which the wheels revolve.

That this continuous action of the active force or moving power on the axle could be obtained in practice, is a question,—for the wheels of the vehicle would revolve so fast in the lower part of the curve, by the specific gravity of the vehicle alone, that the engine employed would not continue to exert the same force on the axle, as in the case of the horizontal railway. The engine would have to resume its power on the axle, and the momentum of the vehicle would be exhausted on the lower half of the curve B E; the engine would then have to do the whole work, and, as (as in the experiments) the carriage would only just move on the horizontal line: it would not move at all on the inclined plane.

With these remarks, I beg to close for the present, and am,

Sir, your obedient servant,

S. D.

May 17.

SHALDERS' FOUNTAIN PUMP.

Sir,—One of your correspondents recently asked for some actual proof of the superiority of Shalders' patent pump. This, I fear, it will be difficult to produce. There can be no difficulty, however, in *proving where it is very inferior* to the common lifting pump now in general use. I will compare it to a pump of the common construction, with a barrel of 4 in. diameter. The patent pump of this size requires a barrel of 6 in. diameter to allow room for the folding of the leather up and down, being an inch all round (as in the one exhibited at the National Repository). The plunger and the water-way are the same as in the common 4 in. pump. Now as the pressure of fluids is according to the altitude and area, I will take the height of the water to be raised at 40 feet, being a common height for a forcing pump, which will give about 17¼lbs. pressure upon the square inch. The area of the common pump will be $4^2 \times .7854 \times 17.5 = 219.91$ to be raised each stroke of the piston, while the area of the patent pump will be $6^2 \times .7854 \times 17.5 = 492.80$ to be raised each stroke of the piston or bucket. It is, therefore, clear that it will require double the power to work the patent pump that it will to work the common one in such a case.

It has been reported in your Magazine, and other publications, that the patent pump will admit of large stones, sticks, lumps of wood, &c. &c. to pass through it with the greatest facility, which no other pump will do, and in proof of this half-a-dozen Spanish nuts were put into the pump exhibited at the National Repository; but if any one will take the trouble to examine they will find that the openings of the valves in the fountain pump are no larger than those in the common pumps.

I am, Sir,

Your obedient servant,

G. Hallen Cottam.

St. John's Wood, March 6, 1833.

ARCANA OF SCIENCE FOR 1833.*

The present volume of this annual publication seems to be "much of a muchness" with its five predecessors. We cannot perceive that the Editor has taken the trouble to introduce any of those im-

* Arcana of Science and Art, or an Annual Register of Useful Inventions and Improvements Discoveries, and New Facts, in Mechanics, Chemistry, Natural History, and Social Economy; abridged from the Transactions of Public Societies, and from the Scientific Journals, British and Foreign, of the past Year. With 43 Engravings. Sixth Year. London, 1833. Limbird. 12mo. pp. 312.

provements in the plan of his work, of which, as might be gathered from our remarks last year, we thought it susceptible. We observe, indeed, that the obituary is now something more than a bare enumeration of the names of deceased scientific characters; that it contains a slight sketch of the life of Cuvier (whose portrait forms an appropriate frontispiece), and a few lines devoted to each of the other eminent men of science who have died in 1832; but then this biographical article is altogether so short and unsatisfactory, and the particulars given so excessively scanty, that the alteration in this respect is hardly felt to be an improvement: four pages are preposterously few to be assigned to that which ought to be so interesting and important a branch of the contents of an annual of this description, especially in a volume stretching over a year unfortunately so fruitful in the deaths of celebrated persons as 1832.

The general arrangement of the work remains nearly the same as before; and the sources from which its information is derived are also nearly the same, the chief variation being that the Magazines devoted to natural history have supplied a greater number of articles than usual. This, however, is partly a natural consequence of the turn which our scientific periodical literature has taken of late; many of those devoted to general science having been discontinued within these few months, and their places supplied by a numerous fry of small zoological, entomological, and all other *ogical* ephemeræ, with some half dozen of Professor Rennie's at their head. Owing to this, and also to the Editor's evident partiality for such subjects, the divisions on natural history, but especially zoology, are of very disproportionate dimensions to those on mechanics and chemistry, which might certainly be expected to take the lead. The former of these two last divisions, and that with which we have most to do, is extremely short and meagre. It includes, indeed, an article on steam-carriages, but as it consists only of an extract from Gordon's Treatise on Locomotion, which has been published several months, it can scarcely be expected to be rich in the newest information on so novel a subject, even eked out as it is by a few notes from the Report of the House of Commons' Committee, (no very valuable document, perhaps,) embodying the oft-corrected error of Mr. Summers, as to his steam-coach having travelled at the rate of 30 miles an hour for 4½ *hours*, instead of *miles*. Some notice of the progress of railways might be reasonably looked for in this section—it will be looked for in vain. The improvements in quick travelling by canals are in the same predicament; and so are many other of the discoveries and "new facts" of the year—and must be the case, indeed, while the work continues on its present plan, that of giving only *extracts* from the scientific periodicals, without any original matter. A general "Annual Register" would make very little way if it were to attempt giving the history of the year in the crude form of extracts from the newspapers; and a scientific "Annual Register" will never succeed in its object of presenting a complete view of the progress of improvement and discovery in the arts within the year, without adopting the plan of a digested synopsis, in which the facts are gathered together and systematically arranged, in the manner of the "View of Public Affairs" in its prototype. This is what we would recommend the Editor of the "Arcana" to introduce in his next volume: let every division be preceded by a history of the science to which it refers, for the preceding year: in this may be absorbed a vast number of the less important facts, and thus more room may be made for inserting those of greater consequence at full length, while the comprehensive form of a digest will afford an opportunity of noticing, at least cursorily, all those little matters which are now obliged to be neglected, because each are not of sufficient importance to form a separate article. Something of this kind ought to be done, for without it the whole series will present too much the appearance of a mere "thing of shreds and patches."

It is always a puzzling task to select extracts from a book which itself consists entirely of extracted matter; and the difficulty is in this instance greatly increased by the circumstance, that almost every article within our own peculiar province—"mechanics"—has already appeared in the pages of the Mechanics' Magazine. The following notice, however, from another division, as it relates to a subject which some time ago excited a little inquiry and speculation amongst

our readers, may perhaps prove of some interest:—

"Some time ago, Mr. Blackwall, one of our most ingenious and original observers, read a paper to the Linnæan Society, adducing facts discordant with Sir E. Home's opinion, that flies walk up glass by means of a vacuum produced in their foot, on the principle of the boys' leather sucker. It is highly probable that Mr. Blackwall is not aware of some of his views having been anticipated nearly two hundred years ago. 'The common fly,' says Dr. Power, 'hath six legs, but goes only upon four; the two foremost she makes use of instead of hands, with which you may often see her wipe her mouth and nose, and take up any thing to eat. The other four legs are cloven and armed with little claws or talons, (like a catamount), by which she layes hold on the rugosities and asperities of all bodies she walks over, even to the supportance of herself, though with her back downwards and perpendicularly inversed to the horizon. To which purpose, also, the wisdom of Nature hath endued her with another singular artifice, and that is a fuzzy kind of substance, like little *sponges, with which she hath lined the soles of her feet, which substance is also repleated with a white viscous liquor,* which she can at pleasure squeeze out, and so sodden and beglew herself to the plain she walks on, which otherwise her gravity would hind r (were it not for this contrivance), especially when she walks in these inverted positions.'"—p. 175.

Travellers' stories are proverbially rather Munchausenish, but we think our tarry-at-home entomologists might be pretty safely backed against them. There are doubtless many astonishing "tricks, changes, and transformations" in the insect world, but, with all allowances, it is scarcely possible to read Dr. Johnson's account of the "planaria" without feeling some little incredulity. It is as follows:—

"From Dr. Johnson's experiments it appears, that if an incision be made longitudinally into the head of the animal, so as to separate its eyes from each other, if the cut has not been carried very far down, it will heal in the ordinary manner; but if the head be absolutely cleft in twain, then, according to the extent of the fissure, there will be a mass of new matter formed by each side of the head, which will either join the two halves together, forming a head of extraordinary size, and bearing in it one or two additional eyes; or each old half, thus cleft, will form the new matter into another half, with an eye, and so the animal have two complete and entire heads. If the fissure be carried further down through the body of the animal, then not only will there be two heads, but two bodies also formed, joined together only by the tail; and when this is the case, so little unanimity does there exist between these *siamoid* twin-planariæ, that they never pull or swim the same way; and so violent are their efforts, that they frequently, in the course of two or three days, tear the only remaining bond of union, their tail, in sunder, and then two distinct and perfect animals result!

"If in a common planaria the head be cut entirely off, a new head will be formed; and if its lower extremity be removed, it will produce a new tail. In a planaria, which, by the operation above described, had been invested with two heads, these "nova capita" were successively severed for three several generations, and were immediately and perfectly renewed, and subsequently the animal was cut through just below the artificial bifurcation, and then only a single head was produced, so that in this more simple 'capital' operation, a single animal became a biceps, and, after having had the use of six heads in succession, was subsequently reduced to the possession of a single one.

"When one of these animals is cut in half, the head, or anterior extremity, swims away as if nothing had happened, and speedily *re*-tails itself, but the tail swims to the bottom, and remains torpid for two or three days, by which time it has formed for itself a head. If a planaria be cut into three pieces, the head will form a new body and tail, the tail a new body and head, and the middle section or body will produce both head and tail. If a quarter be removed by making a longitudinal incision through the head, and half down the body, and then a semi-transverse cut to remove the upper quarter, not only will the three remaining quarters speedily reproduce a new fourth, but also the separated fourth will form to itself three new quarters. Indeed, a planaria has been cut into as many as ten pieces, and each piece has become an entire perfect animal.

"The above facts are physiologically curious, as they show a still closer affinity than had been previously supposed to exist between the propagation of plants and animals by cuttings, as well as seeds; for they have shown that this mode of propagation can be carried to an almost equal extent in the one as in the other."—p. 159.

This is rather a wonderful story, certainly; so wonderful, that most people will be inclined to think that Dr. Johnson did not watch the operations of Nature

instance closely enough to pre- the possibility of his being mis- Such mistakes have been the of most of the marvellous tales of t and modern notoriety.

embellishments of the "Arcana" the usual calibre; with the excep- the frontispiece (already noticed); onsist of a few outline plates of iery, and several decently exe- wood-cuts, most of which have be- ppeared in another work by the ditor and publisher, "The Mirror."

MR. AUDUBON.

n we some time ago presumed to question the truth of the stories re- y the American bird-catcher, Audu- nly echoing in this, however, the ns of his own countrymen—our Bri- turalists were in general very wroth s for going out of our way (as they o cast dirt on a man whom it had de- l them—"much better judges of his than we could pretend to be"—to : above all ornithologists, living or We begin now, however, to meet roofs that even among naturalists lves Mr. Audubon's reputation is uch on the wane. In the last Num- the *Magazine of Natural History* s a very smart paper by Mr. Charles ton, the eminent naturalist and tra- in which he speaks thus freely of on's pretensions, both scientific and :—

thout leaving behind him in America any reputation as a naturalist, Mr. Audubon to England, and he is immediately pointed s as an ornithological luminary of the first ide. Strange it is, that he, who had been ach a dense cloud of obscurity in his own latitude, should have broken out so suddenly ch dazzling radiance the moment he ap- d our eastern island! I ask, what produc- Mr. Audubon's is it that has called forth pturous applauses from our naturalists, who, tent with their own prostration, would fain e the public to bow submissive to the ? His drawings are out of the question, ing solely a work of art. Can it be his n the habits of the *Vultur Aura*, which was to prove that this bird has hitherto been sadly too much nose? No: that produc- amentably faulty at almost every point. Its r is bad; its composition poor; and its nts are so unsatisfactory, that, in my opinion, son who reads the paper with any moderate f attention will feel inclined to condemn it ame kind of fate as that to which the curate barber condemned the greater part of Don e's library. Then it must be his *Biography ls* which has raised the stranger so high in mation of Mr. Bull? No doubt whatever: re the *Biography of Birds* really the pro- of Mr. Audubon's own pen, I should not y in praising its *literary* merit, notwith- g its *ornithological* faults. But, having ed the style of the *Biography of Birds* with that of the article on the habits of the *Vultur Aura*, I came to the conclusion that these two productions could not have been written by the same person, though they both have the name of Audubon attached to them. The first is that of a finished scholar; the second that of a very mode- rately-educated man.

* * * *

"In one part of the introductory address, Mr. Audubon seems to wish to impress his readers with an idea of his extreme abhorrence of those who put their names to works which they never wrote. He says, 'There are persons whose desire of ob- taining celebrity induces them to suppress the knowledge of the assistance which they have re- ceived in the composition of their works. In many cases, in fact, the real author of the drawings or the descriptions, in books on natural history is not so much as mentioned, while the pretended author assumes to himself all the merit which the world is willing to allow him. This want of can- dour,' continues Mr. Audubon, 'I could never en- dure.' Now, I possess undeniable proof that, when Mr. Audubon was in England, he did ac- tually apply to a gentleman to write his history of the birds for him. The gentleman at first con- sented to write it; but the agreement subsequently fell to the ground, on account of Mr. Audubon in- sisting that *his own name* should be given to the world as the *author of the work*. To this the gen- tleman would by no means listen, having probably in mind the old verse, which would have suited his case admirably, with a trifling alteration:—

"Has volucrum vitas scripsi, 'tulit alter honores.'
'Twas I who put these birds in story;
Another wears my wreath of glory.'"

MODE OF KEEPING A STEAMER'S COURSE IN A THICK FOG.

Mr. Editor,—You will oblige an old naval officer, and perhaps do a public ser- vice, by inserting the following in your widely-circulated Journal.

Seamen generally are aware of the great difficulty attached to keeping a course in a thick fog; but this is increased in a ten- fold proportion on board a steam-vessel by the great rapidity of their progress, which occasions them to dart away to the right or left quicker than it is possible for any compass to indicate, and which sudden va- riation may be attended with extreme danger to others as well as themselves.

On Saturday, the 11th of May, I was a passenger with 128 others on board the Ramsgate steam-packet, City of London, commanded by Captain K. B. Martin, and was highly gratified by a simple but effec- tive plan adopted by that gentleman to as- sist the man at the helm in keeping the vessel steady to her course in a thick fog, which came on at Gravesend, upon our passage to Ramsgate.

A small line (log line) is marked at every 20 feet with red slips or pennants of bunt- ing, to the length of 150 fathoms; at each end a half-pound, egg-shaped lead, is at- tached; the centre of the line is then hoisted to the foremast-head by means of the signal haulyards; the leads are thrown

overboard, outside all the rigging and shrouds, from each paddle-box, and passing quickly astern the lines with their little pennants, spread over each quarter into the wake of the vessel; having the foremast-head for their radii, it is evident that any material alteration in the vessel's course is immediately perceived and attended to—the one line straying wide away from the vessel's side, the other crossing over the steersman's head till he rights the helm and brings her again steady to the compass.

On the day in question it was very thick, and the Captain effected what he proposed when the fog came on.

We passed within sight and hail of Herne Bay Pier, Margate Pier Jetty, Broadstairs Pier, and arrived in Ramsgate Harbour at the usual hour of 5 P. M. I recommend this plan with confidence to commanders of steam-packets, as no vessel is without the material necessary for its adoption.

And I remain, Mr. Editor, yours,

AN OLD SAILOR AND CONSTANT READER.

LIVERPOOL AND MANCHESTER RAILWAY.

We have more than once had occasion to notice the unfair attempts made by the partizans of canals in opposition to railways, to represent the Liverpool and Manchester Railway as an entire failure, as far as regards the conveyance of goods, and are now glad to be able to lay before our readers unanswerable evidence of the falsity of these representations. From the last half-yearly Report of the Directors it appears, that "the success of the undertaking depends not on any single branch of business, but that each of the great divisions of the concern, the transit of passengers, of merchandise, and coal, have severally and largely contributed to the revenues of the Company." The total quantity of merchandise conveyed along the line, in the six months ending the 31st December last, was 86.842 tons; the total quantity of coal, 39,940 tons; the total number of passengers, 182,823. There were 3,363 trips of 30 miles performed with passengers; 1,679 with goods; and 211 with coals. The increase in merchandize during the last six months, as compared with the preceding half-year, was 7,821 tons, in coals 10,484 tons. One of the most prominent articles, under the head of merchandise, is timber. In the five months preceding 31st December, no less than 2,297 tons were conveyed to Manchester; and excellent accommodations for the unloading of timber having been provided at the Manchester end, the Directors anticipate a very considerable increase of business in this department.

LOCOMOTIVE ENGINES.

In the Report from which we have extracted the preceding particulars, the Directors advert in terms of severe disappointment to the "excessive expenditure" on account of the repairs of the engines. During the last six months of 1832, it amounted to £7,076 5*s.* 8*d.* "The principal items of this expenditure have arisen," it is said, "from the frequent renewal of the tubes and fire-places, which in most of the engines have been found to burn very rapidly away. To this general result, however, there have been some exceptions; for the Company have engines which have run between twenty and thirty thousand miles with very inconsiderable repairs, either to the fire-places or tubes." The Directors feeling assured that, "in mechanical operations, what *has been* effected *may be* effected" again, have been unceasing in their endeavours to ascertain whence this extraordinary difference in point of durability arises, and "earnestly invite the attention of scientific men to the subject." Even with its present imperfections, however, the Directors do not hesitate to pronounce the locomotive engine as being "beyond comparison the most eligible, indeed the only efficient moving power."

London and Birmingham Railway.—Among the Parliamentary papers on the subject of this railway, there is a very elaborate estimate by Mr. Lecount of the road and canal traffic for one year between London and Birmingham, &c. The following are the general results:—Passengers 233,155; goods 62,389 tons; parcels 46,799; beasts 50,839; sheep 365,000; pigs 15,634. The expense by the existing means of transit is about 1,338,217*l.*, while by the railway it will not exceed 800,728*l.*; thus exhibiting an annual saving to the country of 537,480*l.*, independently of the numerous advantages to be expected from the unrivalled celerity of this mode of conveyance.

INTERIM NOTICES.

Mr. Rutter's reply to J. P. N. in our next.

We have communicated the different letters we have received on the subject of the Bruges Stove to Messrs. Cottam and Hallen, of Winsley-street, Oxford-street, the manufacturers. Mr. Stanley will hear from them shortly.

The parties who recently inquired for the address of J. J. may now have it on application at our Office.

Communications received from G. M.—Violino. Mr. S. Nicolson.—Mr. Whitelaw.—Pertinax.—B. B.

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Mechanics' Magazine,

MUSEUM, REGISTER, JOURNAL, AND GAZETTE.

No. 511.] SATURDAY, MAY 25, 1833. Price 3*d*.

NICOLSON'S IMPROVED SHIP'S WINDLASS.

Fig. 1.

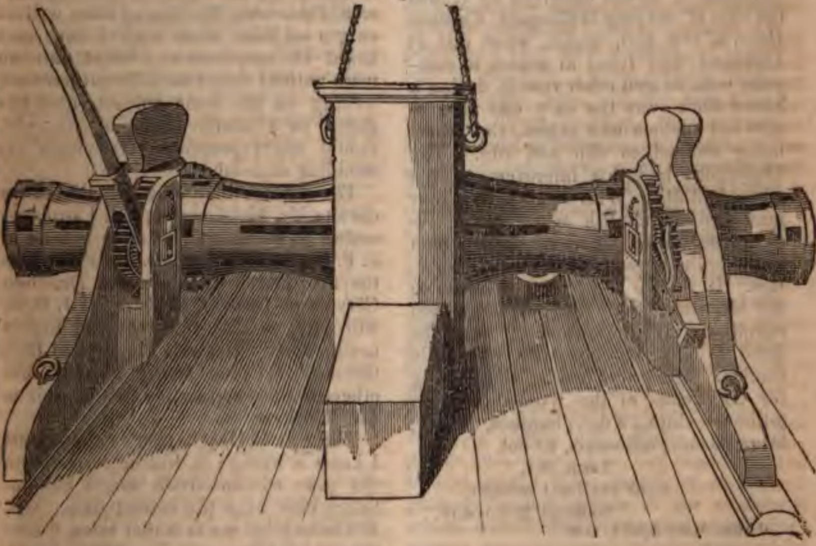


Fig. 2.

NICOLSON'S IMPROVED SHIP'S WINDLASS.

Sir, — Being a subscriber to your valuable Mechanics' Magazine, I take the liberty of forwarding to you a drawing of my improved ship's windlass, which is now adopted by nearly every valuable American vessel, built within a few years. Simplicity, power, and durability are its principal merits, and its usefulness has been so often experienced that I am desirous your countrymen may participate in its benefits. Among the instances of vessels preserved by it was the case of the ship Hellespont, Captain Pratt, of this port, which, when last at Liverpool, and lying at anchor in company with sixteen other vessels, during a heavy blow, was the only one able to save her anchors and cables, the others being obliged to slip and run. The Hellespont had this improvement, the others had not. With this windlass four men can accomplish what would require the united efforts of sixteen men in the ordinary mode of working a windlass. It will be seen, by a reference to the drawing, that the gearing which comprises my improvement, may be fitted to any windlass with very little trouble. The prices here of the gearing for both ends of the windlass, are as follows:—ships, 75 dol.; barques, 67 dol.; brigs, 60 dol.; schooners, 40 dol.

I am, Sir,
Your obedient servant,
SAMUEL NICOLSON.

Boston, Mass. April 4, 1833.

RUTTER'S OBSERVATIONS ON GAS-LIGHTING.

Sir,—Instead of being displeased with J. P. N., of Birmingham, I shall always be thankful to him, or any other person, who in a spirit of kindness will take the trouble to put me right when I am wrong. I hope I have learned enough to convince me that I have yet much more to learn. In looking for "erroneous statements" in my little shilling pamphlet, I wish that J. P. N. had been content with the use of his eye-glass or spectacles, and not have employed a microscopic lens of such immense powers.

To Mr. Matthews, who is, I believe a very estimable man, and who has evinced considerable talent combined with zeal and industry, I never intended to *express my obligations,* because I was not conscious that I owed him any. Respect and good-will I do owe him as a fellow-labourer, and in proof of that I have purchased both his works upon gas. I have never read the "History of Gas-lighting" with sufficient attention to have rendered it available, had I required its aid. The "Compendium" came to my hands *after* my own work was written, and the greater portion of it printed off. For "certain expressions" employed by me I am no more indebted to Matthews, than I am to Winsor, Accum, Peckstone, Ricardo, or other writers on gas subjects, whose works I have only heard of, never seen. What can be more natural than that different persons, writing on the same subject, and engaged in a similar train of thought, should use expressions very much resembling each other?

The sources of information that were open to Mr. Matthews are not, I suppose, sealed to others. It is mere trifling in J. P. N. to say, that Mr. Matthews was the first person who described Dr. John Clayton as *Dean of Kildare.* If J. P. N. will refer to that excellent and highly useful work, "Gorton's Biograpical Dictionary," he may satisfy himself that others could ascertain the fact as well as Mr. Matthews.

The date of Dr. Clayton's experiments I know is wrong; it will be corrected in the next edition—1673 would be probably very near the correct date. Mr. M'Culloch led me into that error, "Dictionary of Commerce," p. 555. I may console myself, however, with being in respectable company.

J. P. N. doubts the accuracy of my description "of the qualities of the compound commonly denominated carburetted hydrogen." Has J. P. N. ever seen any carburetted hydrogen? Be it remembered, I do not in that place describe the compound *commonly denominated* carburetted hydrogen, but the veritable compound itself, whose light resembles that of a common tallow candle.* The connexion will sufficiently shew that I am endeavouring to distinguish between carburetted hydrogen, commonly so called, and as formed by

* "It burns with a strong yellow flame, similar to that of a candle."—Thompson.

"It burns with a yellow flame, giving out vastly more light than hydrogen gas."—Henry.

"It burns with a yellow flame like that of a candle."—Ure.

l means, and that which results
ontaneous decomposition.

N. thinks I am mistaken in de-
; the flame of pure hydrogen gas
ıg of a "pale green colour."
erhaps, I am. It may be I have
efect of the visual organs. If I
: regret to say that many others
hom I am acquainted labour un-
; same infirmity. Until I saw
.'s objection I never gave myself
ıble to seek for the colour of the
of hydrogen among "the most
· works on chemistry." In this,
as many other instances, I have
› presumptuous as to trust to the
:e of my senses. I find I must
our to behave better in future,
:he writer of a popular work says
.s blue, or black is white, why I
of course, believe it. The flame
rogen is mostly described, I per-
as being of a "yellowish blue
' Since yellow and blue com-
constitute green, it seems, after all,
ot far from the truth. I must still
in, notwithstanding, that to my
ıe flame of hydrogen is of a pale
colour, not blue.

ure hydrogen I intend the word
its popular sense. Absolutely pure
en gas is very difficult to procure,
is, I think, still more difficult to
ine the colour of its flame.

anot close this letter, Sir, without
ing my thanks to a "Gas-maker,"
kindness he has displayed in his
ry clever letters. I shall have no
: objection to an occasional kick
C.," or a thump from "J. P. N.,"
I can thus be the means of intro-
· to your readers such satisfactory
of good sense and discrimination
ther quarters.

J. O. N. Rutter.

3, 1833.

'TRIUMPH" OF SAXULA NO EVI-
CE OF THE TRIUMPH OF STEAM
ELLING ON COMMON ROADS.

—Some time has now elapsed
ou favoured me with the insertion
ew lines on long and short cranks,
I hazarded in opposition to the
of locomotion promulgated by
ıgenious correspondent "Saxula,"
ch I promised the result of a series
eriments I had *then in contem*plation, but which I have been unable to accomplish, from want of time, change of residence, &c. Trusting, however, that my not having fulfilled my engagement may not debar me from your pages, I beg, as a constant reader, to offer a few remarks which have suggested themselves since reading the account of the "Triumph Steam Carriage" in your Journal of the 6th of April last.

I am still at a loss to comprehend what advantage "Saxula" anticipates from the use of the main levers, over that of an ordinary crank, save that he will by that means be able to increase his power at a very great reduction of speed, and, I conceive, a great waste of power at the same time. In the first place, does he mean to deny, that a short crank would accomplish the same end, providing the power were increased in due inverse ratio, and to uphold that more can be accomplished by the use of long cranks, or *main levers*, than by short ones? If so, I need say no more, for of that I shall never be convinced. Again, if the adhesion between the periphery and the road be sufficient to enable him with his long lever to lift the fore carriage off the ground, where is there any necessity for an increased resistance or *interlocking force?* Such a tendency would only cause a loss of power and straining to the machinery; besides which there would be an irregularity in the motion of the vehicle, which would also be attended with very serious waste of power, arising from the reciprocal action of the main levers. Although "Saxula" may have accomplished the ascent of a hill, having an inclination of 1 in 6, I still maintain that the same thing might be accomplished by means of a short crank, provided the cylindrical power of the engine were increased proportionately. "Saxula" may, perhaps, here ask—but why cumber your engine with more power than is actually necessary? Let him make his engine on that principle, and run it on a road—not one rolled and brushed for the purpose—and he will soon find he will be "put to a stand still." Hills are not the only obstacles which present themselves (Mr. Gurney well knows this). Newly-formed roads, or repaired ones, are much more serious objections to steam carriages on common roads. We

will suppose a road (as is often the case) repaired at intervals, of say a quarter of a mile—would the "staid and sure" pair of long levers be used? or alternately levers and cranks, to the great annoyance of passengers, and prejudice of the machinery? So many delays would completely do away with steam travelling, if there were no other objections to it.

But the objections to such a mode of conveyance on common roads, compared with rail-roads, are so numerous, and rendered so obvious by the daily experience on the Liverpool and Manchester railway, as to need but little comment. I understand the estimated cost of an engine for common roads, capable of conveying about 20 passengers, is 1,500*l.*, while the utmost speed which could with safety, or *otherwise*, be accomplished, would be 12 to 14 miles per hour. Now, an engine capable of conveying upwards of 300 passengers in covered carriages on a railway, at 20 miles per hour, costs only 800*l.* or 900*l.*. The wear and tear of an engine on high roads is also very considerably greater than that on a railroad, owing to irregularity of surface. I believe at 15 miles per hour it would be 7 times greater, and the force of traction 12 times as great. Supposing, therefore, that only the same consumption of fuel should take place, the diminished number of passengers would of course raise the fares in due proportion. But certainly the expediency of using locomotives on common roads can only be proved or disproved by actual experience. I heartily agree with "Saxula" in wishing some practical results to be given forth by the numerous and extensive speculators in such machines. I am afraid "Saxula" will find himself in error, when he states that an engine of 2 horses' actual power will be able to accomplish the labour of 2 horses on common roads. This is daily proved to be impossible: even on a rail-road a portion of power is lost by the reaction, or *backsliding* (if I may so term it) produced by the deposition of extraneous matter on the surface of the rail, which causes the wheel, or rather the engine, to retrograde in a slight degree. This I have proved very frequently when travelling on the above railway. I have in fine weather invariably found that 86 beats or strokes of the engine are necessary to traverse the distance between the ¼ mile distance accurately measured, thus proving that 2 revolutions are lost in each instance, the wheel being precisely 5 feet diameter. This I have observed at speeds of from 14 to 18 miles per hour. At 25 miles per hour nearly 4½ revolutions are lost. This, I think, would militate greatly against "Saxula's" two horses.

I am, Sir, your's, &c.

DUBITANS.

Liverpool, May 7, 1833.

LONDON PRECAUTIONS AGAINST FIRE—IMPROVEMENTS SUGGESTED.

Sir,—In my last (of the 3d instant,) I said a good deal about the state of things in St. Petersburgh, in regard to fires. I will now, with your permission, turn to London, and offer a hint or two for improvement there, for which, by all accounts, there is still ample room.

I would first beg to impress on architects, and builders of new houses, the propriety of introducing *stone* staircases. The difference in cost would not be much, in the long run perhaps nothing at all, while the additional security to life and property would be immense. In all large houses, with two staircases, the back stairs ought at all events to be of stone. But even in the third and fourth rate class of houses I do not see why stone should not be employed. Supposing a ground floor to be 12 feet high, that will require a stair of 20 steps of about 3 feet in width, which will only take up a space of 6 feet by 12; and for the sake of commodiousness there may be a landing at the 10th step half-way up—all as shewn in the following rough sketches, of which fig. 1 is a side elevatigon, fig. 2 an end view, and fig. 3 a plan.

Fig. I.

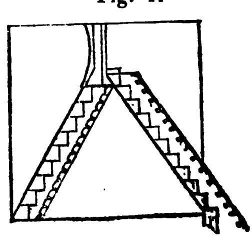


Fig. 2.

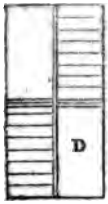
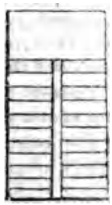


Fig. 3.



width of 3 feet will, I consider, te sufficient for the removal of ticles of furniture as are in comse among the inmates of such By building the stair in two is those hateful triangular steps winders, which have caused many us fall, would be got rid of. D the thoroughfare or door. The airs may have bars of iron under or their better support, as I have ere in many instances. They of course, have wrought iron bases.

her suggestion I have to offer reo fire-plugs. When it is dark, streets are muddy, or a crowd has ed on the spot before the engines there is generally a good deal of ty in finding the plugs, and much st in consequence. I would thereropose that, exactly opposite to ire-plug, there should be a lamp glass of a pink colour, so that the of a fire-engine might drive up to ry spot without the delay of a instant. The cost of such a lamp be so trifling that I dare say the ces would themselves gladly de-

Your humble servant,
WILLIAM REED.

off, Jan. 10, 1833.

reader will be struck with the similarity this plan and *that suggested by Mr. Bab- the last edition of his "Economy of Ma- nd Manufactures,"* respecting the post-office receiving-houses. (See our last vol., p. 431.) Mr. Reed could not, however, have seen Mr. Babbage's suggestion at the time he wrote.—Ed. M. M.

EDUCATION OF THE PEOPLE—LIBERAL OFFER TO STUDENTS OF GEOLOGY.

Sir,—I now peruse with far greater interest than I have heretofore felt each part of your excellent miscellany, since I find that education for the people, as a means to their advancement, is so ably advocated by such men as Samuel Downing, Robert Potts, Junius Redivivus, and R. of Bayswater; and I beg to offer them the just tribute of my sincere thanks for the valuable information they have conveyed on this most important subject. I have been particularly pleased with the last article by R. of Bayswater, in answer to a communication by Junius Redivivus on the "population question," and his clear and lucid arguments against those who support the Malthusian theory, as it is called, which, in my opinion, is calculated to make all such persons "hide their diminished heads," and "blush with conscious shame," that they had not examined more attentively the productive powers of the globe we inhabit, before they presumed to promulgate opinions so much at variance with reason, with nature, and with common sense.

For some years my attention has been turned to the consideration of means to effect the amelioration of the majority of the great human family who, in all countries, do indeed require improvement; and, with many other congenial minds, I have come to the conclusion, that until ignorance, with its concomitant effect, error, is removed, mankind never can advance in the correct path of improvement, which in many instances is happily opened to them; for, owing to previously adopted and cherished errors, many are incompetent to direct the current of their thoughts aright, and many others are even afraid to embrace the opportunities for free inquiry, which at the present time are in a variety of ways liberally offered them.

Sir, I consider that, at the present epoch, every man possessing valuable and useful knowledge should disseminate it extensively for the advantage of his fellow-men; and, agreeably to that conviction, I hereby offer my extensive museum of geology, containing many thousand specimens (illustrating the various changes and productions on the crust of

the earth), to the inspection and observation of all those of both sexes who feel an interest in the acquisition of this branch of knowledge, every Thursday morning at 11 o'clock, at my dwelling-house. It is my decided opinion, that the science of geology will tend, more than any other portion of natural philosophy, to direct our reasoning in its proper path; and that, in conjunction with its sister science, astronomy, it cannot fail to enlarge, to expand, and ultimately to direct rightly, the thoughts, feelings, and actions of men, with reference to all their brethren of the human race in every zone, district, and country.

If friends will attend punctually at the hour above named, I shall feel great pleasure in going over my collection with them, and explaining, as we proceed, the conclusions which geologists have come to with relation to the singular phenomena of the changes which have occurred on the earth; and this I frankly offer, without pecuniary fee or reward, for my full and ample reward will be in the delightful sensations that are always experienced when developing and elucidating truths—most important, indeed, to all, yet heretofore not comprehended but by few. I hope to number in the list of my visitors your correspondents to whom I have referred at the beginning of this notice; and knowing that there exists a congeniality of sentiment among us, I hereby tender them all the hand of fellowship in the great and glorious work of emancipating the human mind from prejudice and error, and thus gradually preparing the way for the moral development and elevation of the character.

Sir J. F. W. Herschel, in a late work, has truly stated, that before we can proceed with success to investigate any of the numerous subjects of natural philosophy, we must absolutely dismiss from our minds every kind of prejudice whatsoever; and another eloquent friend expresses himself in a similar manner, with a quotation from whom I shall conclude:—

"If it be absolutely necessary, as it unquestionably is, that, in the pursuit of knowledge of any kind, before experience itself can be used with advantage, we must dismiss from the mind all prejudices, *from whatsoever source they may arise*, this *mental purification* becomes the more indispensable *in a science* like geology, in which we meet, at the very threshold, with facts that disturb all our preconceived opinions of the nature of the globe on which we live, and teach us that though man be, as it were, but the creature of yesterday, the earth has teemed with countless forms of animal and vegetable existence, myriads of ages before the creation of the human race."

Education is the most important of sciences; and in practice we must necessarily divest our minds from every prejudice which has hitherto trammelled and prostrated the minds of youth.

Yours, respectfully,

W. D. Saull, F. G. S. &c.

15, Aldersgate-street, May 16, 1833.

THE UNDULATING RAILWAY.

Sir,—Since I last wrote to you I have seen Mr. Badnall's treatise on railway improvements; but I must confess I see therein no statement which tends to shake my incredulity on the subject of hill and valley locomotion. I still prefer the level, and doubt not of its being the most economical railway. In the way of argument I have nothing to add to my former letters on the subject. I did, indeed, wish to ask one or two questions, which I had intended to put when I read your review, and the extract, stating that the moving power of the experimental carriage was a steel spring coiled round a barrel; but I have since found that a writer in the Magazine edited by the Messrs. Cobbett has forestalled me. It is by him stated, that the experiments were unfair; that in the case of both the level and the curve, the carriage was traversed backwards along the whole line, and that on the curved line the distance traversed was considerably greater than on the horizontal line, consequently that the spring was wound up to a greater amount of tension. He states further his belief, that if the carriage were wound up on the level road, and then placed in motion on the curve, that it would stop half way from want of power. Whether this statement be correct or not, I cannot pronounce, not having seen the trials, but the winding up of a spring is assuredly a matter of considerable importance, when we consider that half a turn of the barrel, when nearly wound up, gives more power than several turns at the commencement.

Mr. Badnall says, p. 74, "In allusion

to the comparative difference in the speed between the two curved railways, in the preceding statement, and in the statement at p. 67, I confess myself in difficulty." At p. 77 he says, "The advantage gained over a common horizontal railway will be in proportion to the length and depth of descent." Now, supposing the moving power to be a coiled spring, t is quite clear that the tension would increase, and consequently the power iwould increase, in proportion to the number of turns, and in a compound ratio. If this be the case, the "difficulty" will be solved, without accounting for it by the "vibration."

From the letter of Mr. R. Stephenson, quoted in Mr. Badnall's book, I take the following extract:—

"This sort of force (*periphugal force*), perhaps, not being thoroughly understood, you will allow me to compare it to a man on horseback, riding at full speed, and the animal stopping himself with all the power he is master of; we should in such a case naturally expect to see the rider thrown forward, taking along with him both bridle and stirrups."

With all deference to the opinion of Mr. Stephenson, I beg to remark that I have been for some years in the habit of studying the laws of "forces," in this very species of involuntary experiment. I have seen numerous riders thus shaken out of their saddles—technically called "purchasing an estate"—and with nearly the result he has described; but invariably their further progress was arrested by friction, both on levels and up hill, the momentum being absorbed by the material on which the falling body impinged, and sometimes so rapidly that it dragged life along with it. Down hill, it is true, the momentum has occasionally been of considerable avail, unless a thicket, or patch of aloes, or spiry larch-thistle, happened to intervene as a recipient. Even thus I suspect the "periphugal force" would impinge upon and be absorbed by the upward ascent of an undulating railroad.

At p. 84 Mr. Badnall talks of having given a *limited* power to his spring, winding it up ten feet and six feet. Why was this small power selected? The experiment seems on too small a scale to justify any reliance on the result. I will state an experiment, which, if it give a result in favour of *undulation, when accurately tried, I shall think that there is* more in Mr. Badnall's scheme "than is dreamt of in my philosophy."

Make two railroads, side by side, with the ends and beginnings parallel. Let one be an horizontal road, say two hundred feet in length. Let the other be increased in actual length, by means of any undulating form Mr. Badnall may choose, till it measures two hundred and twenty-five or fifty feet. Then let a barrel-spring be adapted to a carriage, so that when traversed backwards on the horizontal road, it may just have power enough to reach the extremity again. Then take the carriage, thus wound up, and place it on the undulating road, and if it reach the extremity of that also, I shall be ready to acknowledge the triumph of Mr. Badnall's *principle*. But even then, unless it perform something more, there will be no gain in point of economy, but, on the contrary, a considerable loss, by the extra expense of material consumed in the road. And here I leave the matter for the present.

I remain, yours, &c.

JUNIUS REDIVIVUS.

P. S.—Illness and the pressure of occupation have hitherto prevented me from answering "R."

Sir,—If you examine the author's account of his invention, as exhibited in your extracts, you will find that in paragraph 3, he says, "that throughout the ascent the pressure upon the rails, and consequently the amount of friction, is precisely the same as it was down the descent AB, viz., as much less than it was on the horizontal line EA as the line CD to DC." Now, surely, the amount of friction is proportional to the lines representing the pressure upon the rails, which are CP and CG, not CD and DC. But even with this understanding, let us see if the inference be correct.

In paragraph 5 we find it stated, "that although the disposable power of gravity, in opposition to pressure, is only as CD to CP, yet this is no criterion of the extent of advantage gained in speed; in fact, CD may as properly be stated to represent the saving in friction."

If CD may be stated to represent the saving in friction, throughout the whole descent, it may also be stated to represent an augmentation of friction up the whole ascent; so that CP being the measure of the former, CP + CD will

be that of the latter quantity. With this in mind, let us see what the author says farther on, that if "the power employed up the ascending part of the undulation, were only just sufficient to overcome the friction and resistance of atmosphere, the carriage would naturally, as proved by the action of the pendulum, rise the ascent B E in the precise time it occupied in traversing from A to B."

Now on the horizontal railway the friction is represented by the C G, but upon the ascent of the undulating railway by C P + C D, which being greater than the other, it would oppose more force to the progress of the carriage, and it would require more power to overcome it.

In thus examining the author's explanation, I am led to think that the amount of friction is not less on the undulating than on the horizontal railway.

I am, Sir,

Your obedient servant,

S. D.

May 20.

HINT FOR BOOKBINDERS — IMPROVED LETTERING TOOL.

Sir,—It is generally known that the lettering of books is performed by means of brass letters, which are heated and impressed singly upon the leather, the place being previously glared and covered with leaf-gold.

Words of very frequent use, however, such as Bible, Prayer, Album, &c. &c. are very often cut in one piece of metal, and so worked off at once; by which means much time is saved, and a neatness and uniformity of appearance produced, not otherwise so easily obtained.

To obtain the same object, without incurring the expense of tool-cutting, some binders have employed metal types, which they have set up in a frame, and so formed the title required. Old English, and other ornamental characters, have been used in this way, with considerable success.

The types, however, require to be clean and bright; there is also some difficulty in giving them the proper temperature, without running some risk of melting them—it therefore appears to me, that a great improvement might be introduced, by cutting moveable letters in brass, so that they might be set up in a frame. These would combine all the convenience of types with the sharpness and beauty of the brass letter.

Your's, respectfully,

W. Baddeley.

ANCIENT AND MODERN OILS.

Sir,—I beg to make a few inquiries in your excellent Magazine respecting the nature and preparation of oils as vehicles in paintings, as it is only by an interchange of ideas with scientific and manufacturing men, through such a periodical medium, that information and facts can be obtained.

It is pretty generally allowed that modern artists, though excelling in drawing and composition many of the old masters, cannot produce colouring so deep and clear as they have done; and it is a fact that they cannot make a copy of one of these old pictures, exhibiting the same clearness and delicacy in colour. That we have the same pigments has been proved by chemical analysis; and it is evident that the oils in a newly painted picture cannot become still more transparent and clear (an error which has long been current among artists), because as they absorb oxygen they solidify and become wax and resin. A few strata of varnish and dirt may mellow and harmonise the effect of a picture, but never can make the colour deeper and clearer; it follows, therefore, that the old masters used oils either different in their nature, or differently prepared to ours. If we mix a coloured pigment with different liquids, the colour (or texture, as the artist calls it,) of each, when dry, will be different; and I beg to submit to your optical readers, that in proportion as the vehicle is lower in refractive power, fixed in its nature, and colourless, the clearness and brilliancy of the pigment is increased.

It seems that all our oils are more volatile and resinous in their nature than those used by the old painters, which is apparent by their growing dim, and the colours appearing chalky.

The quailities of a good vehicle for painting, exhibiting deep and clear colour, are, that it be of low refractive power, that is, not shining, or shewing surface in the picture (as any thing in the shape of varnish or resin invariably does), still keeping its clear liquid ap-

pearance—that it be capable of receiving a quick drying quality, and that it be applicable to glazing colours, or have such a consistency as to keep the colour suspended in it. That such an one the old painters had is evident in their productions, and from the manner in which the colours are left on their canvass.

The questions I wish to ask are,—whether the oils expressed from various kinds of nuts would not have less volatile and resinous qualities than those expressed from the seeds of plants? Whether there is not a difference in the oil caused by the age of the seed before expressed, and by the mode of expression with or without heat; and what difference in quality is there in the first and last quantities of oil drawn from the seed?

It has been said over and over again, that the artist cannot purchase pure and genuine nut oils (from walnuts I presume); that they are, more or less, sophisticated with linseed oil. The truth of the assertion would be worth knowing.

Poppy oil, though having one good quality, a colourless one, is tediously long in drying, without cramming it with metallic oxides, and common linseed gives by far a deeper colour to the pigment.

I am, Sir,
Your obedient humble servant,
E.

Manchester, March 14, 1833.

THE LATE WILLIAM SYMINGTON AND THE APPLICATION OF STEAM TO LOCOMOTIVE PURPOSES.

Sir,—On the 9th of March an article appeared in *Chambers' Edinburgh Weekly Journal*, stating that a Mr. James Taylor was the inventor of steam navigation, and making very free with the character of my father, the late William Symington, whose claims to the invention of locomotive steam carriages and of steam navigation your valuable Journal has liberally assisted to establish. The Editors of *Chambers' Journal* were challenged to produce certain documentary evidence in support of their representations, of which they pretended to be in possession; but though more than five weeks have since elapsed, their pledge remains unredeemed—for the strongest of all *reasons probably, namely,* the impossibility of redeeming it. Were I inclined to act in the same bad spirit which seems to have influenced the biographers of Taylor, there might be little difficulty in throwing back on his memory that odium which they have sought to heap on the memory of my lamented relative. But as I have no wish to do more than filial duty and affection absolutely demand at my hands, I forbear. Let not, however, Mr. Taylor's friends reckon too confidently on a continuance of my forbearance, should they provoke retaliation by further aggression.

Judging from past circumstances, I think it not improbable that the descendants of Mr. Miller, of Dalswinton, a gentleman described as a sort of copartner of Taylor, may probably attempt to renew a claim on his behalf: but it will be seen from the "Narrative," of which I send you a copy, drawn up by my brother-in-law, Mr. Robert Bowie,* that the utmost that can with any feasibility be claimed for Mr. Miller, in relation to steam navigation, is the application of paddle-wheels, in place of sails or oars, to the propulsion of vessels. Even as regards this, however, Mr. Miller's claims to originality may be very fairly disputed. I have now before me a "Treatise on Ship-building" by one Witsen, published at Amsterdam in 1621, in which there is an engraving of what is called a Liburnian (Leghorn) vessel, *propelled by paddle-wheels turned by oxen.* Of this engraving I enclose an exact copy.

An early insertion of this communication will oblige,

Sir, your most obedient servant,
WILLIAM SYMINGTON.

Mary-street, Bromley,
May 13, 1833.

The "Narrative" by Mr. Bowie, forwarded along with the preceding letter, is stated to have been "drawn up from a memorial presented to the Lords of his Majesty's Treasury in behalf of William Symington, and from documents in the possession of his family." The general purpose of it is to show that the late William Symington was the inventor both of steam navigation and of steam land tra-

* A Brief Narrative, proving the Right of the late William Symington, Civil Engineer, to be Considered the Inventor of Steam Land Carriage Locomotion; and also the Inventor and Introducer of Steam Navigation. By ROBERT BOWIE. Sherwood and Co. 1833.

velling; but that he derived from these important inventions neither the honour nor the profit to which they justly entitled him.

As the facts which serve to establish Mr. Symington's claims to be considered the inventor of steam-vessels and steam-carriages have been hitherto noticed but imperfectly in our pages, we shall here avail ourselves of the assistance afforded by Mr. Bowie's "Narrative" to present them in a connected but condensed form before our readers, along with some interesting biographical particulars of this very meritorious but ill-requited individual:—

"Mr. Symington was a native of Leadhills, in Lanarkshire. He received an education for the church, but an early predilection for mechanics led him to abandon his theological studies. Before completing his twenty-first year he had made several improvements on the steam engine; and, having protected them by letters patent, constructed and introduced engines on his principle into different parts of England and Scotland.* As early as 1784 it occurred to him that steam might be rendered available for the propulsion of locomotive carriages. He immediately set about embodying his idea; and, in 1786, submitted to the inspection of the professors and other scientific gentlemen in Edinburgh, the working model of a steam carriage, of which an engraving and description was given in the Mech. Mag. of the 20th October, 1832. While the model was in Edinburgh, Patrick Miller, Esq., of Dalswinton, who had heard of it from Mr. James Taylor, tutor in his family, who had been a schoolfellow of Mr. Symington, minutely inspected it, and expressed himself highly pleased with its construction and performance. In the course of conversation, Mr. Miller mentioned that he had spent much time in making experiments for the propelling of vessels by wheels, in place of sails or oars; and that they had been put in motion by applying animal strength to turning a handle or winch. Mr. Symington on this observed, that he thought a steam engine might be constructed which would propel a vessel, by communicating a rotary motion to the paddles by the alternate action of two ratchet wheels, in the same manner as in the model of the steam carriage then before them. Mr. Miller said he considered such a thing impracticable; and inquired how it would be possible to work such an engine on board, without setting the vessel on fire? The description given of the model, and the manner in which it was intended to apply the power of steam, seemed to convince Mr. Miller of the practicability of the project, and he agreed that an experiment should be made, on a small scale, as soon as Mr. Symington could attend to it.

Soon after Mr. Symington accordingly constructed a small engine for the purpose, which was fitted on board a double-keeled vessel, lying upon a lake, near the house of Dalswinton. With this vessel a trial was made, in the autumn of 1788, in presence of Mr. Miller, and various persons of respectability, when the boat was propelled in a most satisfactory manner. An engraving and description of this vessel and its maachinery has also been given in the Mech. Mag. Sept. 15th, 1832.

In October, 1789, a second exemplification of the practicability of this mode of propulsion, but on a much larger scale, was exhibited on the Forth and Clyde inland navigation, in presence of hundreds of spectators. The engine, which was four times larger than the former, was constructed at Carron works, under the direction of Mr. Symington, and erected in a boat of Mr. Miller's, which had been used on the canal in some previous experiments. Mr. Miller, Messrs. John Adam of Blairadam, John Balfour, of Pilrig, Ambrose Tibbetts, members of the Carron Company, James Taylor, and David Drysdale, a seaman, who took charge of the helm, were on board. The boat glided along, propelled at the rate of nearly six miles an hour.

After thus establishing the correctness of his views, Mr. Symington had the misfortune to lose the patronage of Mr. Miller, for reasons which are variously related, but do not in any manner affect Mr. Symington's claims to the invention in question. Mr. Symington's pecuniary resources being insufficient to enable him, unaided, to go farther in endeavouring to introduce steam navigation, he was compelled to desist, and turn his attention to other pursuits.

After an interval of ten years, the late Lord Dundas applied to Mr. Symington, and having alluded to his former experiments, expressed a wish that he would construct a vessel capable of being propelled by steam, in dragging vessels upon the Forth and Clyde canal, of which his lordship was an extensive proprietor. The vessel, called the Charlotte Dundas, which is described in the Mech. Mag.

* A little more information on this head than is given in the "Narrative" is desirable. What were the "improvements" in question? What was the date of the patent? And was it for both England and Scotland, or for Scotland only?—Ed.M.M.

Dec. 15, 1832, was accordingly constructed and fitted up with the requisite machinery under Mr. Symington's direction; and in March, 1802, Mr. Symington took on board this vessel, at lock No. 20 of the canal, Lord Dundas, the Honourable Captain George Dundas, R.N., Archibald Spiers, Esq., of Elderslee, and several other gentlemen; and with two laden vessels (the Active and Euphemia, Gow and Esplin, masters), each of seventy tons burthen, attached to the steam boat, performed with great ease the voyage to Port Dundas, Glasgow, a distance of nineteen miles and a half, although it blew so strong a gale right-a-head, during the whole course of the day, that no other vessel in the canal attempted to move to windward.

In consequence of this complete verification of the utility of Mr. Symington's invention, a proposal was made to the proprietors of the canal to substitute steam boats as tugs in lieu of horses; but it was rejected, on the ground that the undulation created in the water, by means of the paddle-wheels, would wash down the banks, and occasion greater injury than any benefit likely to be conferred by the invention could counterbalance.

Lord Dundas afterwards recommended Mr. Symington to the notice of the celebrated Duke of Bridgewater, in the hope that his Grace might be induced to adopt steam power upon the extensive canals of which he was the sole proprietor. Mr. Symington repaired to London for the purpose of having an interview with the Duke; and on exhibiting to his Grace a model of his boat, and explaining its construction and capabilities, the Duke was so satisfied of the advantages to be gained, that he gave Mr. Symington an order to build forthwith eight boats on the same plan, for the use of his canal. Mr. Symington returned to Scotland, elated with the prospect of being able in a short time successfully to introduee steam navigation; but almost immediately after he received tidings of the death of the Duke of Bridgewater, and the commission of course fell to the ground.

Broken down in spirit by these successive disappointments, and unable to find elsewhere the patronage and assistance requisite for the prosecution of his schemes, Mr. Symington was doomed to see not only the splendid prize, which he thought secure within his grasp, appropriated by others, but his claims to it denied and misrepresented. When a committee of the House of Commons was appointed, in 1824, to inquire into the nature of the engines employed on board of steam boats, Mr. James Walker kindly interested himself in behalf of Mr. Symington, and sent him notice that he thought it would be proper to get a memorial drawn up and laid before the committee. Before this, however, could be accomplished, Mr. Symington was informed that the investigation had terminated. He was induced, under these circumstances, to present a memorial to the Lords of his Majesty's Treasury, in consequence of which 100*l*. were awarded from his Majesty's privy purse; and a year or two afterwards a further sum of 50*l*. He was in hopes an annual allowance might have been procured, but he was disappointed; and all he ever received for the trouble he had taken to collect documents, furnish drawings, and defray his expenses, were the sums already noticed.

After this disappointment Mr. Symington gave up all hope of having justice done to him. His health had long been in a declining state, and it was evident that his end was now fast approaching. He died in London, at the house of his son-in-law, Mr. Bowie, on the 22d March, 1831. The 'ruling passion' was strongly exhibited by him a few hours prior to and even at the moment of his death. The irregular form of his bedroom occasioned him so much uneasiness, that, when he became slightly delirious, he requested his son to reduce it to a proper square. And his last act was an imitation of winding up and adjusting a newly invented chronometer, which he had nearly completed.

"Thus died," says Mr. Bowie, "an ingenious man; one who, possessed of the highest talents, possessed not that knowledge of the world to enable him to guard against duplicity; and who, when he found he had been taken advantage of, had too independent and indignant a spirit to trumpet forth his distresses, or proclaim his wrongs. It is a pleasing reflection that, although deserted by his country, he was never destitute of a home. Ill in body, and depressed in mind, he came to London in the hope of experiencing relief. Finding his health to improve, he resumed his mechanical pursuits; and, until his disappointment by Government, seemed likely to have been spared, even for years. His mortal remains rest in the churchyard of St. Botolph, Aldgate-without: so that he owes not even a grave to the land of his nativity. Mrs. Symington is still alive. It is intended again to attempt to bring the subject of Mr. Symington's claims before Parliament: and if nothing else should accrue from the trial, it may be the means of affording to posterity just grounds for reflection, and of fixing

on a firm foundation, his right to the title of inventor of steam locomotive carriages and of efficient steam navigation."

Affidavits by the Messrs. Stainton, the Managers of the Carron Iron Works, and others, in support of the principal facts contained in the earlier part of the preceding "Narrative," are stated to have been left at the Treasury along with Mr. Symington's memorial.

The persons in whose behalf the claim of Mr. Symington to the introduction of steam navigation are contested (his right to the honour of being the first to suggest and exemplify by a model the application of steam power to *terro-locomotion*, does not appear to be disputed by any one,) are, 1. Mr. Taylor; 2. Mr. Miller; 3. Mr. Bell; and 4. Mr. Fulton. The claims of these persons we shall consider in succession.

1. *Mr. Taylor* (who is now also dead) has left the grounds for his pretensions on record in a letter which he addressed to Sir Henry Parnell, the Chairman of the House of Commons' Committee, before mentioned. He there states that it was he who suggested to Mr. Miller the application of steam power to the working of his paddle-wheels, a considerable time before he introduced Mr. Symington to Mr. Miller; that "being acquainted" with Mr. Symington, and knowing he had "invented a new construction of the steam-engine," a model of which he had seen at work, he asked him "if he could undertake to apply his engine to Mr. Miller's vessels;" that Symington "answered in the affirmative, and from friendship he recommended both himself and engine, and afterwards introduced him to Mr. Miller;" that "after the classes of the college broke up," he (Taylor) superintended the castings of the engine with which the first experiment on Dalswinton Lake was made, and took Symington with him "to put the parts together;" that in 1789, he "repaired to Carron with Mr. Symington," and "constructed" (that is, he, Taylor, constructed) the engine employed in the second experiment, and that on returning to Dalswinton, and "producing the account of the expense at Carron, Mr. Miller became irritated and disgusted at the conduct of the engineer, who had more than doubled both the time and expense unnecessarily," "swore he was a vain, extravagant fool, *and did not care how much of his money he wasted, but he should never have that in his power again, for he would have nothing more to do with either him or his engine.*" All which is, according to Mr. Taylor, "a true, faithful, and correct account of the origin and rise of the present system of steam-boats."

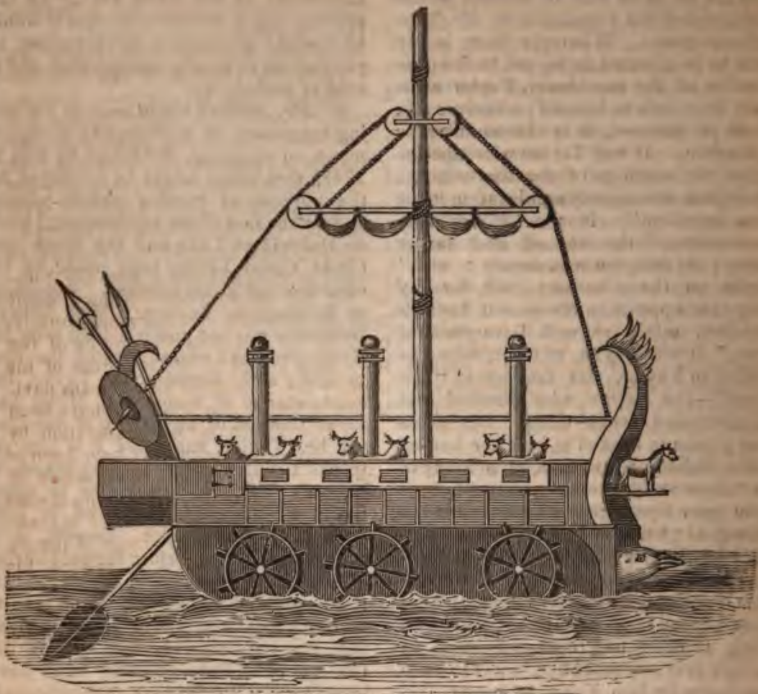
The whole of this statement, it is important to observe, rests on Mr. Taylor's own bare assertion. He was constantly contradicted on all the material points by Symington; and had not the scrape of a pen to show in corroboration of his pretensions from Mr. Miller, though he continued on intimate terms with that gentleman to the period of his death, which was long after Symington had been publicly taken by the hand by Lord Dundas as the real author of steam navigation. We have, therefore, to inquire what there is about the statement itself to entitle it to credit? Does it bear the impress of truth or of fiction? Let us see. Mr. Taylor says he was "acquainted" with Mr. Symington; knew he had "invented a new construction of the steam-engine;" and had seen a model of it at work. That he was acquainted with Symington is admitted; they came from the same part of the country, and were fellow-students at college—we have heard that they even lodged together in the same house while in Edinburgh. Being so well acquainted with Symington, he must of course have heard of the steam-carriage which Symington exhibited at the college full two years before his introduction to Mr. Miller; so surprising a thing (at that time of day) must have been talked of by every body, and not least frequently, we may be sure, by the inventor himself. But, strange to say, Mr. Taylor makes no allusion to this steam-carriage whatever in his narrative; unless, indeed, "the model" which he says he saw at work was the model of that carriage, which we think most likely. How is this studious suppression of so important a fact to be explained? Was Mr. Taylor apprehensive that if he made mention of Symington's steam-carriage, people would have said at once, "Oh, then, there could be but little merit in your suggesting to Mr. Miller that the same power which turned the wheel of a carriage on land would turn the wheel of a vessel on water?" Can there, indeed, be any reasonable doubt that it must have been something of this sort which passed

between Taylor and Miller? We are the more inclined to adopt this conclusion from the *palpable* want of fairness which distinguishes the remainder of Mr. Taylor's statement. Wherever there is any merit to be gleaned in regard to the construction of the machinery, Taylor arrogates the whole to himself; wherever any blame is incurred, it is thrown on poor Symington. It was Taylor who superintended the castings of the first engine; Symington was merely employed to "put them together." It was Taylor who "constructed" the second and larger engine; Symington was merely "with" Taylor on the occasion; and, for any thing that appears on the face of Taylor's narrative, might as well have staid at home. It was Taylor, in short, who, according to Taylor, was the actual "engineer"—the person who directed and superintended every thing. But when some person is wanted to bear the burden of Mr. Miller's reproaches, on account of the "time and expense" incurred, it is again poor Symington who is made the scape-goat; he, who had never been dignified by Taylor with the name of "engineer" before, is created for the nonce "*the* engineer;" and has a great deal of abuse heaped upon him in that character, which, if there had been any truth in Taylor's previous narrative, ought to have been borne by him alone. Observe, further, the respective qualifications of Taylor and Symington for the parts thus assigned to them: Taylor, who was a student of divinity, and confessedly no mechanic or engineer, superintends castings and constructs engines—and Symington, who was really a practical mechanic and engineer, and particularly well acquainted with steam machinery, is merely a passive instrument in the hands of this inspired son of the church! What likelihood is there in all this? Clearly none whatever. Besides, if Mr. Taylor really played the part he pretends to have done in the construction of the machinery in question—if, especially, he "constructed," as he says he did, the second and largest engine—he must have been known in the capacity of constructor at the Carron Works, where it was built, and there could have been no lack of testimonials of his having been so regarded. Mr. Stainton, who was then the Manager of these works, is still alive. As usual, however, the only authority for Mr. Taylor's engineering pretensions is Mr. Taylor himself. Many other objections suggest themselves to the claim set up by this person; but it seems to us that it would be a waste of words to dwell further on pretensions so wholly unsupported and so void of probability.

2. *Mr. Miller's* claim rests on his having suggested, in a Narrative of experiments on shipping, published by him in 1787, that steam might be employed for the purpose of turning paddle-wheels, and on the fact of the experimental trials on Dalswinton Lake and the Forth and Clyde Canal having been made by his direction and at his expense. According to Symington, however, Mr. Miller's Narrative was not published till after he, Symington, had communicated the idea to him; and, according to Taylor, the acquaintance of Symington, Miller had never thought of any thing of the kind till he, Taylor, suggested it to him (at second hand, as there is every reason to believe). Mr. Miller's claim to originality is, therefore, negatived by both Symington and Taylor. Besides, it is certain that, a year before the publication of Mr. Miller's Narrative, the steam-carriage model of Symington, which involved the whole principle of steam navigation, had been publicly exhibited in the College of Edinburgh, and must have been known to Miller's acquaintance, Taylor, who was the intimate acquaintance of Symington. But although we cannot, therefore, concede to Mr. Miller the merit of having first conceived the idea of navigating vessels by steam, we cannot withhold from him the praise of having done more than any one other individual—Symington alone excepted—to bring the scheme into practical operation, by the readiness and liberality with which he contributed the necessary funds for the purpose.

Mr. Symington, jun., questions unnecessarily the claim of Mr. Miller to the invention of paddle-wheels. We do not think that Mr. Miller, who was a gentleman of extensive reading and information, as well as of great public spirit, could ever have intended to claim them as his own. The substitution of wheels for oars is as old, at least, as the time of the Romans, and notices of it are to be found in many ancient works. We shall here insert the figure, which Mr. Symington has copied for us, from Witsen's

Dutch book of 1658; but merely in order that we may show, from a much older work, that the thing is of far greater antiquity than Mr. Symington imagines.



Now, in the *Res Memorabiles. Ambergæ*, 1599, p. 127, Pancirollus, a professor of Padua, is stated to have seen, in 1587, an ancient bas-relief, which represented "a galley with three wheels on each side of a boat turned by three pair of oxen;" as exact a description, it will be observed, of this Leghorn galley of Witsen, as if it had been designed for it, and no other.

3. *Mr. Bell.*—The claims of this person will, we think, be satisfactorily disposed of by the following extract from Mr. Bowie's "Narrative":—

"During the time the boat lay at Bainsford, Henry Bell, of Glasgow, was frequently beheld inspecting it; and, in 1811, he, in conjunction with others, constructed the Comet steam boat, which in that year first plied upon the Clyde. With regard to Bell, it can be indisputably proved that he had numerous opportunities of witnessing the whole of Mr. Symington's exemplifications, from their commencement to their termination; and that he was at Carron Works, where he was often seen inspecting the machinery, even while it was being manufactured. Indeed to such an extent did he carry his curiosity, that the workmen used to complain to Mr. Symington of being unable to keep him out of the place where they were making the patterns. Reference to the books of the Carron Company will prove the circumstance of his having been present. Much praise has been awarded to Bell for the introduction of steam navigation; but how far he deserves it the following facts will elucidate:—Notwithstanding the many opportunities he had enjoyed,—notwithstanding his having voyaged to America, to instruct or to be instructed by the celebrated Fulton,—the Comet was far inferior in her performance, even to Mr. Symington's second exemplification. When the Comet commenced her operations as a passage boat upon the Clyde, she possessed four insignificant paddle-wheels; and took nine hours to sail from Port Glasgow to Glasgow. The Elizabeth steam boat was the next constructed. Bell

hinted his intention to prevent her being built; but his pretensions were too well known to induce the followers of his piracy to pay any attention to his threats; and he soon had the mortification to see numerous and far more elegant vessels deprive him of the advantage at which his lawless cupidity had tempted him to grasp."

4. *Mr. Fulton.*—Another extract from Mr. Bowie's pamphlet will serve to show that though Fulton had undoubtedly the merit of introducing steam navigation on the waters of the western world, he derived his first ideas of it, while in this country, from Mr. Symington:—

"It happened one day during the month of July, 1801 or 1802, while Mr. Symington was conducting his experiments under the patronage of Lord Dundas, a stranger came to the banks of the canal and requested an interview: he announced himself as Mr. Fulton, a native of North America, to which country he intended to return in a few weeks; but having heard of the steam-boat experiments, he could not think of leaving Scotland without waiting upon Mr. Symington, in the hope of seeing the boat and machinery, and procuring some information as to the principles upon which it was moved: he remarked that however beneficial the invention might be to Great Britain, it would certainly be of more importance to North America, considering her many navigable rivers and lakes, and the ease with which timber could be procured for building such vessels and supplying them with fuel. He thought fit farther to say, that the usefulness of steam vessels in a mercantile point of view could not fail to attract the attention of every observer; and that if he was allowed to carry the plan to North America it could not but turn out to Mr. Symington's advantage, as if inclined for it, or his other engagements would permit, the constructing, or at least the superintending the constructing, of such vessels, would naturally devolve upon him. Mr. Symington, in compliance with the stranger's earnest request, caused the engine fire to be lighted up, and the machinery put in motion: several persons entered the boat, and, along with Mr. Fulton, were carried from lock No. 16, where she then lay, about four miles west; and returned to the place from whence they had started, in one hour and twenty minutes, to the astonishment of Mr. Fulton and the other gentlemen present. Mr. Fulton asked and obtained leave to take notes and sketches of the form, size, and construction of the boat, and apparatus; after fully satisfying his curiosity, he took his leave; but he never afterwards had the honour or the gratitude to acknowledge his obligation to Mr. Symington."

Mr. Bowie, it will be seen, states that the widow and children of Mr. Symington intend to apply again to Government, to take into consideration the claims of their deceased relative on the gratitude of the country. After what we have said, can we do less than express our earnest wishes for the success of their application? If Mr. Palmer and his representatives were deemed well entitled to the gift of a large fortune from the public for the introduction of the present mail-coach system; much stronger, surely, must be the claims of the family of the man who added to the resources of his country the invaluable art of steam navigation. For all the hours that have been gained in celerity of communication by mail-coaches, as many days have been or will be gained by the introduction of steam-vessels. Of Mr. Symington's claims in regard to steam-carriages we say nothing; for if there be not sense of justice enough in the country to reward his family abundantly for the services he rendered to steam navigation, it would be to little purpose that we urged his claims on other accounts.

CAOUTCHOUC BALLS.

Sir,—Mr. Rutter is wrong in stating, p. 89, that balls of caoutchouc are adapted for holding oil. The oil is a solvent, though not a very rapid one. Time immemorial, the Indians of Colombia have been in the habit of preparing waterproof cloaks, by means of a film of caoutchouc between two thicknesses of an eligible material. In riding on horseback, the tail of the cloak or poucho becomes decomposed by the fatty matter exuding with the sweat of the horse's flank. Under pressure, with oil in it, the caoutchouc ball would soon decompose.

I remain, Sir, yours, &c.

JUNIUS REDIVIVUS.

May 16, 1833.

Sir,—Mr. Rutter has described, at p. 89, his method of inflating India-rubber bottles.

I have filled a number of these balls

myself, both by condensing air into them and also by the pressure of a column of water; and find that water acts injuriously upon the caoutchouc.

The better way is to use *dry heat*, by holding them before a fire, turning and warming them equally. If any irregularity occurs in the substance of the bottle, by applying more heat to that particular place, and proceeding slowly and cautiously with the expansion, few ruptures will take place.

I have obtained in this way balls from twenty to twenty-two inches in diameter.

After the bottle has been inflated to a certain extent, by placing it in a warm atmosphere, the air will expand and the caoutchouc at the same time yield increased capacity; more air may then be thrown in, and expansion again brought about by heat, the process being continued until a ball of great magnitude is obtained.

The thin substance of the ball, when broken, answers exceedingly well for tying over jars or bottles, in lieu of bladder. It also makes excellent washers for the screw joints of pneumatic apparatus.

I am, Sir, yours respectfully,
WILLIAM BADDELEY.

London, May 21, 1833.

English Cement.—The *Journal des Connais. Novelles* gives the following as being "perhaps, with some variation, the true recipe" for a cement which is sold in the shops of Paris by the name of English cement, (Query, the Diamond cement?) and has acquired "a justly merited reputation for its adhesive qualities":—Take one half pound of the curd of skimmed milk and wash it until the water with which it is washed remains quite clear; then mix the curd with six whites of eggs, and add the juice of the fifteenth part of a clove of garlick; pound the mixture in a dry mortar, and add gradually sifted quicklime until the whole is formed into a dry paste. When wanted for use, a portion of the paste is to be ground in a piece of glass with a little water. Whether this be the true English composition or not, it is said to possess precisely the same properties, "resisting both fire and boiling water when it has been dried with proper care."

How to revive Gilt Frames.—Beat up three ounces of white of eggs with one ounce of chloride of potassa or soda, and do over the frame with a soft brush dipped in this mixture. The gilding will become immediately fresh and bright.

LIST OF NEW PATENTS GRANTED BETWEEN THE 22D APRIL AND 22D MAY, 1833.

James Noble, of Little Horton, parish of Bradford, Yorkshire, worsted spinner, for a machine for combing wool and other fibrous materials. To enrol within Six Months from April 25.

Archibald Douglas, of Manchester, manufacturer, for certain improvements on power looms and the shuttles used therein. Six Months; April 30.

Charles Collinge, of Lambeth, engineer, for an improvement or improvements in the making or manufacture of axletrees. Six Months; May 2.

Christopher Robinson, of Athlone, Ireland, for certain new or improved machinery for transferring caloric from aeriform or fluid bodies to other bodies of the like description, and applicable to other useful purposes. Six Months; May 2.

John Holmes, of Birmingham, engineer, for an improvement in metallic shanks for buttons. Two Months; May 4.

Henry Jones and Thomas Jones, both of Marple, county of Chester, weavers, for a certain method of expanding or stretching cloth and keeping it even during the process of weaving, and of preserving the selvages thereof. Two Months; May 4.

William Norvell, of Newcastle-upon-Tyne, engineer, for an improvement of the machinery now in use for making strands from the yarns and laying ropes by such machinery at one and the same time. Two Months; May 7.

James Fraser, of Bevis Marks, St. Mary Axe, in the City of London, engineer, for certain improvements in steam-boilers, and in the arrangement of the machinery attached thereto, as applicable to land carriages. Two Months; May 7.

Thomas Spinney, of Cheltenham, gas engineer, for a new combination of materials for the manufacture of crucibles, melting pots, and fire bricks. Six Months; May 11.

Louis Paul Lefort, late of Grand Couronne, near Rouen, France, but now residing in Cornhill, London, merchant, for an invention communicated to him by a certain foreigner of certain improvements in machinery or apparatus for making or manufacturing lace, commonly called bobbin net. Six Months; May 17.

William Graham, jun., of Glasgow, cotton spinner and power loom manufacturer, for an invention communicated to him by a foreigner of a self-acting temple to be used in the operations of weaving by power or hand loom. Six Months; May 22.

INTERIM NOTICES.

We beg to direct the attention of our readers, and of students of geology in particular, to the very liberal offer, contained in our present number, from Mr. W. D. Saull.

Iver Maciver's "Hyding for Hyde" came too late to be included in this Month's Part; but, according to his request, we give Mr. Hyde this intimation of the rod that is in pickle for him.

Communications received from Mr. Baddeley.—Mr. Reed.—A Mechanic.—Bergein.—R. T. L.—Worcester Literary and Scientific Institution.—A. B.—Mr. Peacock.—A Constant Reader.—Mr. Downing.—G. W.—Samuel Seaworthy.

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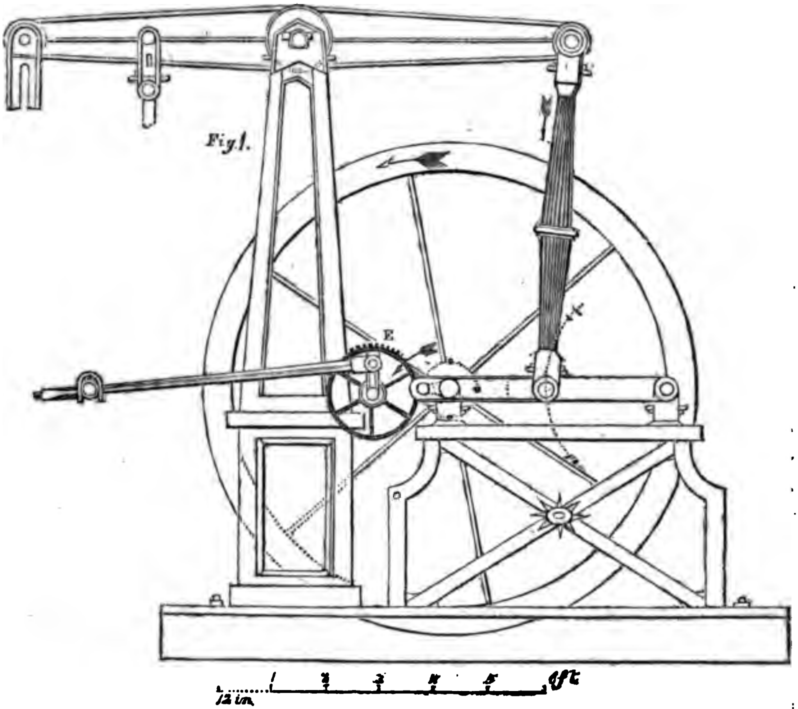
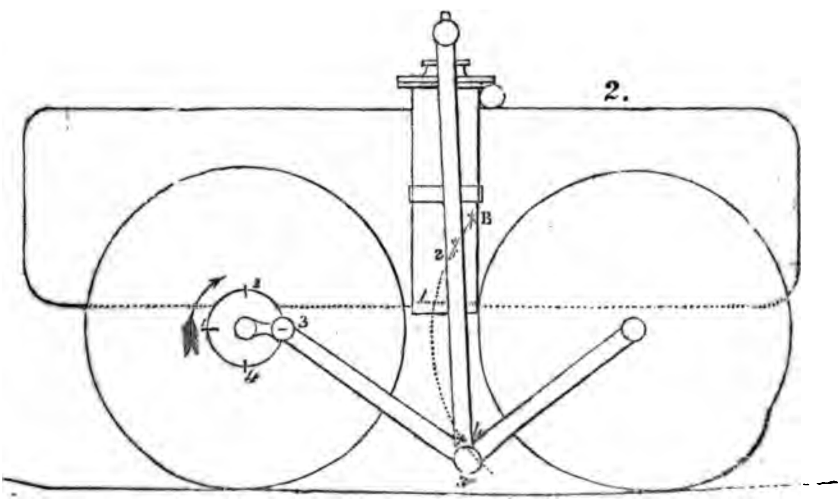
Mechanics' Magazine,

MUSEUM, REGISTER, JOURNAL, AND GAZETTE.

No. 512.] SATURDAY, JUNE 1, 1833. Price 3d.

REED'S MULTIPLYING LEVER.





DESCRIPTION OF A MULTIPLYING LEVER, INTENDED TO SUPERSEDE THE SUN AND PLANET MOTION OF THE STEAM ENGINE.

Dear Sir,—The accompanying drawings represent a new combination of machinery, by which I propose to supersede altogether the present sun and planet wheels in the steam engine. I think it may be not inappropriately termed a MULTIPLYING LEVER. I have had a working model of it made, which answers so well as to leave me in no doubt whatever as to the perfect efficiency of its action.

Fig. 1 is an elevation of a fixed engine, with this multiplying lever adapted to it; fig. 3 is a plan; and fig. 4 a geometrical or skeleton view of the lines of this lever motion. The fly-wheel, it will be seen, makes two revolutions for one up-and-down stroke of the beam. Tooth wheels are used for opening and shutting the valves by a tapet, instead of the ordinary eccentric, one double the diameter of the other. I find that there is far less friction with wood cogs, fitting tight into metal ones, than with an eccentric. The cylinder may be made considerably larger than usual, and will of course not want so much repair.

In fig. 2 is shewn how this lever may be applied to locomotive carriages, so that there shall be two revolutions of the carriage-wheel for each double stroke of the piston.

I shall not at present descant on the advantages to be derived from the adoption of this improvement, but submit it as it is, to the judgment of the mechanical world; and am,

Dear Sir,
Your humble servant,
WILLIAM REED.

Peterhoff Mills, Feb. 1833

Fig. 3.

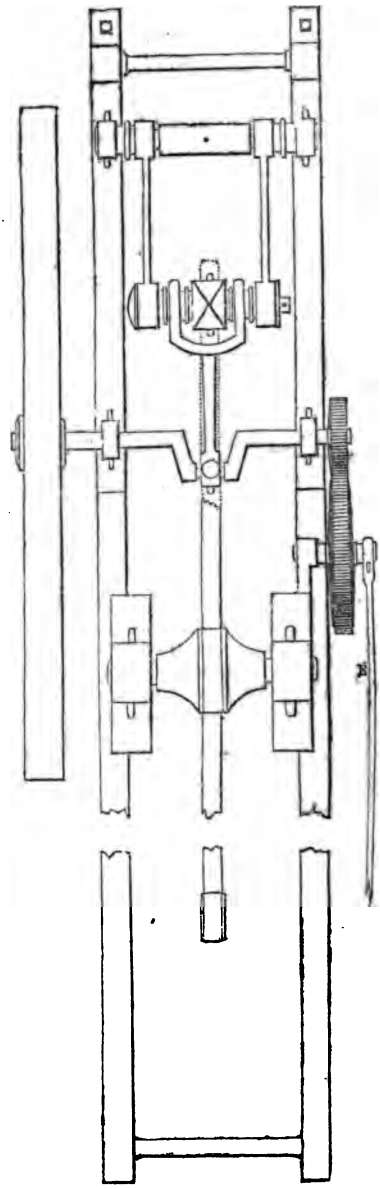
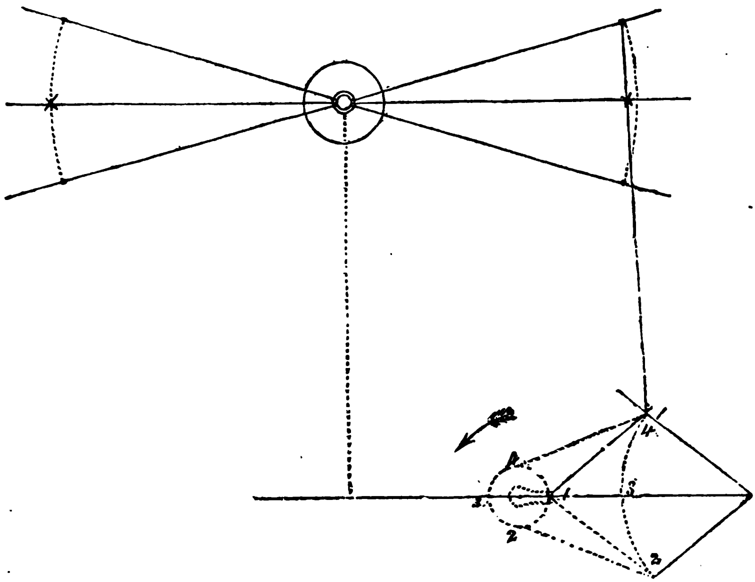


Fig. 4



THE ARTS OF LIFE PREFIGURED IN THE WORKS OF NATURE.

Sir,—When the various arts of life are examined with the eye of a naturalist, the number of those which can be fairly said to be the entire result of man's own unassisted invention is singularly few. The groundwork of most of them may be found in what are called, by way of contradistinction, the works of nature, and even in many cases both groundwork and superstructure. Let us illustrate a few examples. Natural dams and bridges are to be found in many places, and the art of constructing them artificially has been taught us by the beaver. For houses of all descriptions models may be found in the moss-covered nest of the wren, or excavated rock of the bear. An ant shews us the shortest way of making a road. The tailor bird teaches the art of sewing; and several species of spiders, in the formation of their webs and bags to contain their eggs, that of weaving, the first rudiments of which may be also seen in the natural cloth which supports the stem of each leaf of the cocoa-nut tree. From birds the first elements of the science of music may be gleaned, from nature those of painting. A *monkey sitting on the branch of a tree, his legs dangling* in the air beneath, may perhaps have taught our forefathers the use and convenience of a chair! The "carpenter bee" emulates the craftsman from whom he derives his name, in the accuracy with which he will bore a large circular hole in the hardest wood; while the whole art of that mechanic could not form an aperture as small as that made by a peculiar species of wasp with its ovipositor. From the large taurus, or unicorn beetle, employed with unwearied diligence in rolling along to a place of security a ball of dung, three times its own size, with its hind feet, the wheelwright may perhaps have learnt the first rudiments of his art. Every animal has a doorway to its habitation; and we are told that the mole closes the mouth of its dormitory on the approach of winter; but the art of forming a door moveable on hinges has been ever considered the invention of man. Even to this beautiful contrivance, however, we have only a secondary claim. A short time ago several nests of a species of spider, known in the Canarese language by the name of boompapa, and by Europeans called the gouty spider, were brought to me. This little animal, the largest of which was about an inch and a half in length

forms a nest in the earth at the depth of eighteen inches or two feet, the whole of which, as well as the narrow passage leading to it, is lined with a substance similar to "whity-brown" paper. At the entrance to this passage there is actually a semicircular door, two inches and a half in circumference, and half an inch in thickness, *moving on a hinge*, the whole of which is formed of the same substance as the lining of the nest. This spider is nearly black, has ten legs, and a kind of coat of mail on the back; two hard substances, similar to the stings of scorpions, protrude over the mouth and point downwards. The bite of this spider is said by the natives to be mortal, a fact which I doubt. It must, however, be rather an unpleasant insect to come in close contact with, as a large one instantly killed a couple of its own species which I put with it in a tumbler, and immediately afterwards disabled a large black scorpion several times its own size. I suspect that it is a species of tarantula. I will take the first opportunity of sending to you the passage and door of one of their nests, for the inspection of those who may wish to see it.

Your's obediently,

BERGEIN.

Malabar Coast, Jan. 10, 1833.

P. S.—Having had a spare hour a few evenings ago, at a solitary house in the middle of the jungle, I sat down and penned the preceding page of rather fanciful speculation. It has since struck me that an occasional communication, respecting the manners and habits of the numerous animals and insects inhabiting the vast regions of India, and which an exile to this country has so many more opportunities of observing than a naturalist who travels for the sake of science only, and remains but a short time at each place, may prove both interesting and useful. To shew that there is yet much to be made known, and many errors to correct respecting them, it is only necessary to refer to that *not* very uncommon animal the elephant. Hardly a print of this huge beast is to be seen that does not represent his hind legs like those of a horse or camel, with the knee turning backwards instead of forwards, as in the human form; and the author of the "History of Maritime and *Inland Discovery*," in Dr. Lardner's *Cyclopædia, whose* works prove him to *be a man of research* and talent, endeavours to throw doubt on the veracity of a traveller, because he affirms that "the tusks of the elephant grow on the upper jaw downwards instead of the lower jaw upwards, as the arras-makers represent them." Did the sapient gentleman ever see an elephant with usks protruding from the lower jaw?

Cochin, Jan. 20, 1833.

SIR CHARLES DANCE AND HIS STEAM DRAG.

Sir Charles Dance, resolved, apparently, not to be outdone by Mr. Hancock, has been recently exhibiting on the road between London and Stanmore a steam carriage, constructed, we believe, on Mr. Gurney's principle—if it be not indeed the identical one which run for some time between Gloucester and Cheltenham, of which Sir Charles was the proprietor; and has announced his intention of soon "running it as a public conveyance." Sir Charles states, that in the course of his Cheltenham and Gloucester experiment, "the distance travelled amounted to nearly 4,000 miles, without a single accident, hurt, or injury of any kind occurring; but that notwithstanding this favourable success, and its gaining ground daily in public estimation, he was opposed by every one that ought to have assisted in forwarding the project, to a degree that forced him, at the end of four months, to abandon it." How often must Sir Charles be reminded of the necessity of telling the *whole truth* with respect to this Cheltenham and Gloucester experiment? Why does he still evade so studiously saying any thing of his expenditure and receipts on the occasion? Why does he not state frankly and explicitly what was the cost for fuel, for repairs, for management, &c.; and in what state, as to tear and wear, the carriage and machinery were, at the end of the four months, compared with the condition of a common coach and horses after running for the same period? It is clear that, until we are placed in possession of all these particulars, it is impossible to form any correct conclusion as to the *real* circumstances which forced Sir Charles to abandon his Cheltenham and Gloucester speculation.

Of the practicability of travelling by steam on common roads there can be no longer any doubt; but whether it is on the whole a cheaper mode of conveyance

(its claims to superior speed on *common roads* we may safely leave out of the question altogether,) than by horses, is a point on which we are still without any satisfactory information. Mr. Hancock has, in the reports with which he has favoured this Journal, of his performances on the Paddington road, set an example which is worthy of universal imitation; but even these reports must be carried over a much greater length of time before any general conclusion can be safely founded upon them. *Apropos de bottes*, what has become of Mr. Ogle?

THE LATE MR. MURDOCH'S LOCOMOTIVE STEAM CARRIAGE.

Sir,—The application of steam power to the apparatus for coining, at Messrs. Boulton and Watts' establishment, excited great admiration; and among the many other improvements derived from the same source, may perhaps be enumerated its early employment for impelling carriages. In a letter which I received several years ago from the late Mr. W. Creighton, their principal draughtsman, he informed me, that "Mr. W. Murdoch, the engineer, had, in 1792, applied it to impel a little carriage on the roads at Redruth, in Cornwall, and at night fixed to it lights produced by *gas*, issuing from holes in bladders, so as to astonish the people there." I cursorily mentioned this fact in the note, page 22, of my "History of Gas Lighting;" and, as the origin of locomotive-engines is become a topic of discussion, it may be deserving of notice. Recently, too, I heard the following anecdote from good authority, indicating the probability of the machine alluded to, being the cause of Mr. Murdoch's subsequent connexion with the works at Soho for the construction of steam engines. It was stated that when Mr. Murdoch had rendered his invention completely efficient, and had also made an excellent model of it, he decided on showing it to Messrs. Boulton and Watt, with the view of deriving pecuniary advantage from this effort of his ingenuity. Accordingly he set off for the purpose; but on his way to Birmingham, happening to stay a few hours at Bath, whilst standing at the door of the inn a gentleman arrived in an elegant carriage, which *induced him to inquire the name of the stranger. His surprise* may be imagined at learning that the traveller was the identical Matthew Boulton, Esq. with whom he wanted the interview, thus unexpectedly met and obtained. Mr. Murdoch's surprise, however, was much increased when Mr. Boulton told him, that having heard of his "little steam carriage," and being desirous of inspecting it, he was actually journeying into Cornwall for that object alone. The model was produced, examined, and admired; and hence commenced a connexion, distinguished by the same liberality which uniformly characterised the conduct of that truly eminent man, who endeavoured to encourage and promote the prosperity of every person meriting his notice and patronage.

Your's, &c.

WILLIAM MATTHEWS.

London, May 27, 1833.

P. S.—The friendly zeal lately displayed by some one of my early acquaintance at Birmingham entitles him to my thanks; but the perusal of Mr. Rutter's pamphlet did not lead me to suspect him of the plagiarism hinted at by your correspondent, though the phraseology in several instances apparently countenances such a conclusion.

DAKIN'S FOCIMETER.

Sir,—I have lately read the Microscopic Cabinet, by Mr. Pritchard, reviewed in your Journal of the 29th September, 1832. Mr. Pritchard there recommends persons, who wish to ascertain the focus of a lens, to go to an optician and get a lens of exactly $\frac{1}{16}$th inch focus, then to ascertain its value on the micrometer, and compare the lens with it, and afterwards to find the focus by the rule of three. Now all this may be done in one operation by using my focimeter, an account of which you will find in the "Philosophical Magazine" for 1828, and which you will perhaps do me the favour to transfer to the pages of the Mechanics' Magazine.

Your obedient servant,

G. DAKIN.

Dereham, Feb 17, 1833.

Description of Mr. Dakin's Focimeter.

(From Philosophical Magazine for December, 1828.)

"I strongly suspect that the focal distances of lenses are generally underrated by opticians. To prove mine I made what may be called a focimeter. It con

sists of a flat piece of brass, which fixes on the arm of the miscroscope. At the end is a female screw that has exactly fifty threads to the inch, to which is fitted a male screw, about half an inch long, with a hole drilled quite through it, and a large ivory head with twenty divisions fixed on its lower end; consequently one division on the head is equal to the $\frac{1}{1000}$th of an inch. After the end of the screw and the brass plate are ground together on a flat hone, there must be glued over the hole in the male screw a small piece of the outer membrane of the eye of the *libellula grandis*, and a piece of very thin foil, with a small hole in its centre, laid over the female screw. When used, fix it to the arm of the microscope, and throw the light up the hole by the mirror; lay the highest power on the foil, turn the screw up till it just touches the foil, and set down the number of turns and divisions that it takes to bring the object down to the focus of the lens. Proceed in the same manner with the rest of the powers; they may then be easily reduced to the nearest fraction, having one for a numerator. By this means I found that my highest power, which I considered $\frac{1}{60}$th of an inch focus, was only $\frac{1}{45}$th inch focus, as it took but half a turn of the screw to bring the object down to the focus. The thickness of the foil may be neglected even in the highest powers, as it does not amount to the $\frac{1}{1000}$th of an inch. The focal distance of large lenses for telescopes, &c. is reckoned from the centre body of the lens (under half an inch focus); but, in my opinion, the focus of microscopic lenses ought to be computed from the surface next the radiant object, otherwise another operation is necessary, viz. taking the thickness of the lens, and adding half of it to the focal distance; but as small lenses are so very apt to be lost or cracked, it is much better and safer to reckon from the surface."

IRON OR TIN CRUCIBLES.

Sir,—I have just succeeded in finding a substitute for clay in the formation of crucibles, namely, sheet iron or tin. Crucibles of these materials will possess the following advantages:—They can be made in all situations, and of any shape, for much less expense; they are not liable to crack; they will last as long (especially if luted), and in many cases longer; they will bring the substances to be melted in closer contact with the fuel, and must, consequently, *melt them in less time, or in a less degree of heat. I have no doubt* they will be found a valuable addition to the laboratory and the workshop. I have only tried them at present to melt brass in, but I have used a cylindrical one about a *dozen* times, full an hour each time, to make different sorts of charcoal in, without *luting*, for which purpose they are much better adapted than any other sort. They are put together by what is called double seaming, and are either in the shape of cones or cylinders. The latter fit into each other, and form either open or covered crucibles. The former may also be inverted and put together with single seams, or they may have a wire turned in and continued in the shape of a handle; they will then form very convenient ladles for melting cements in, and may be hard soldered up. When used for high heats they might be luted with clay and sand, or lime and borax; a cylindrical one would then form an air-tight crucible, and if enclosed in an earthen one would stand the highest heats for the longest time.

I am, Sir,
Your obedient servant,
G. Dakin.

Dereham, Feb. 17, 1833.

LARVÆ IN THE HUMAN BODY.

It is a well-established fact, that animals have issued from various parts of the human frame, however much the idea may have been ridiculed. But scepticism in science is daily yielding to observation; and the investigations of practical men are clearing away much of the rubbish that popular belief and prejudice have placed in the way of naturalists. Facts, well authenticated and indisputable, are now received as scientific records, which a few years ago would have startled the best-informed minds of the day; whence we are led to hope that science will continue to advance, and unfold to us more of those hidden operations of nature, which are yet mysteries to us, and seem now inexplicable.

Man, wonderfully and fearfully made, is heir to ills unknown to most of us—among which may be enumerated those arising from punitive insects, that "bore into his flesh, descend into his stomach and viscera, derange his whole system, and thus often occasion his death"—of which several instances are related by Kirby and Spence in their work on Entomology. I am convinced that many of those village tales that excite derision at

the moment in most but the unfortunate sufferer, would, if thoroughly investigated and plainly recorded, shed light, when properly collected and compared, on many of the mysteries that now perplex us.

It is well known that the gad-fly (*Æstrus L.*) sorely annoys cattle and other quadrupeds; but it is not generally known that there is a species appropriated to man. Its existence has been unnoticed by entomologists, at least in books, since Gmelin's edition of the Systema Naturæ, until Humboldt and Bonpland mentioned, that, to the myriads of musquitos, which render uninhabitable a great and beautiful portion of the torrid zone, may be added the *æstrus hominis*, which deposits its eggs in the skin of man, and causes tumors.* Gmelin mentions it on the authority of the younger Linnæus, and says that it remains beneath the skin of the abdomen six months, penetrating deeper, if disturbed, and sometimes occasioning death. Even the gad-fly of the ox, leaving its proper food, has been known to deposit its eggs in the jaw of a woman, and the bots produced from the eggs finally caused her death.†

In Jamaica a large blue fly hovers around the sick, and is with difficulty prevented by nurses from depositing eggs in the nose, mouth, and gums of the invalids. Lempriere records‡ the case of a lady who, after recovering from fever, fell a victim to the maggots of this fly, which from the nose found their way through the os cribiforme into the cavity of the skull, and afterwards into the brain.

In a *Memoire Apterologique*, Hermann gives the figure of an *Acarus marginatus* seen running on the corpus callosum of the brain of a patient, at the military hospital at Strasburgh, just as the pia mater was separated. He adds, that it is not the first time insects have been seen in the brain. He quotes C. Gemma, who says, that, on dissecting the brain of a woman, there were found abundance of vermicles and punaises.

It is well known that beans and other extraneous bodies often form a nucleus for stones in the bladder; and it is not more wonderful that a larva should be found in that viscus than that a bean should have germinated there—and that fact is sufficiently established.—*Dr. Rensalaer: American Journal of Science.*

* Essai sur le Geograph. des Plantes, 136.
† Clark, in the Linnean Trans., Vol. III.
‡ On the Diseases of the Army in Jamaica.

REMARKS ON WHITELAW'S IMPROVEMENTS ON BARKER'S MILL. (See Mech. Mag. for March 2, 1833.) BY MR. NATHANIEL SCHOLEFIELD.

(From the Franklin Journal for February, 1833.)

The principal improvement proposed consists in giving the arms which deliver the water a curved form, the curve being such that the water will run from the centre to the extremity of the arms in a straight line when the machine is at work.

By this arrangement, says the author, no centrifugal force is communicated to the water, as it has not received any rotary motion from the arms, which would have been given had the arms been straight.

Mr. Whitelaw, after describing his modification of Barker's mill, goes on to make several deductions in relation to power, and to the advantages which this form possesses; these conclusions I shall endeavour to show are erroneous, as well in a theoretical as in a practical point of view.

In the first place, suppose the orifices in the extremity of the arms, or jet holes, to be of the same area as the passage through the arms in all their parts, in order that the water shall pass with a uniform velocity in its whole course through the arms, as proposed by Mr. Whitelaw, then the principle of action, as well as the form of Barker's mill, is altered; for in that mill the motion is generated at the orifices or jet holes, where the water leaves the arms, and is communicated to the mill by a proper reaction; whereas, in the proposed form, the motion is generated from the centre, as the water enters the arms, and in a direct line from the centre; the mill being put in motion only by the action of the water in endeavouring to pursue a straight course, in the direction first impressed, through the arms which are curved. Now, the force which the water thus exerts to put the mill in motion is much less than in the original form of the mill: for the whole force of the column is at first spent in projecting the water into the arms, producing a reaction from the arms towards the centre, which has no power to put the mill in motion; and next, the impressed force remaining in the water, it moves through the arms, and in consequence of their curved form, its action, in passing through them, puts the mill in motion, the action of the water being so oblique that a small portion only of the power is communicated to the mill. It is evident that the mill moves only with a power proportional to the square of the difference between the velocity due to the

height of the water in the mill, and the velocity with which it actually passes through the arms, minus the friction in passing through them; for, as action and reaction are equal, every action of the water on the curve of the arms produces a corresponding reaction or retardation of the water.

The author is, I think, mistaken in supposing that the water will pass from the centre to the extremity of the arms in a direct line when the mill is loaded, let the arms have what form they may; it can scarcely approach to such a motion when the mill is without a load; for the water, in leaving the upright trunk is forced, in a rectilinear direction into the arms, and if the motion of the mill is such that the water pursues the direction in which it is first projected, its exertion to propel the mill, or to continue its motion, will be nothing.

Mr. Whitelaw says that the weight which would stop the mill must be equal to the weight of a column of water twice the height of the water in the mill, and having a base equal to the sum of the areas of the jet holes. But I shall proceed to show that the weight required to stop it, minus the friction of the water in passing through, and also the friction of the mill, would be to a column of water half the height of the water in the mill, on the base before stated, as the portion of the circumference bf is to half the circumference, or a semicircle, until the portion bf is equal to a semicircle, beyond which this proportion will not hold. For any nonelastic substance, such as water, communicates only half its motion by percussion or contact; and water passing in a curve by any force does not wholly lose or impart its force until its direction is reversed, which is the case when it has passed through a curve equal to a semicircle.

If the area of the jet holes is smaller than a section of the arms, the circumstances will be measureably altered. Suppose them to be equal to half the area of the openings through the arms, then the water passes through the arms with half the velocity that it issues through the jet holes; here reaction takes place, as the water issues from the jet holes with an increased velocity, but only in proportion to the whole power, as the square of the difference of the velocity in the holes and arms is to the square of the velocity due to the height of the water in the mill.

I have thought fit to make the foregoing observations and statements, without entering into a detailed explanation of my views, wishing to be as brief as possible, and presuming that those acquainted with *the subject will readily* understand and acknowledge my position, and that Mr. Whitelaw, by reviewing the subject, may be led to acknowledge that his conclusions were incorrect, if what I have stated is true.

I now suggest what in my view would be an improvement in the application of Barker's mill. It is known that a considerable part of the power remains in the water after it has left the mill, especially when loaded; as the velocity of the mill is necessarily much less than that of the water through the jet holes. This plan I actually put in operation a few months since on a small scale: I placed a common tub wheel immediately under the mill, on the same shaft with it, so that the water as it left the mill would strike the wheel which moved in one direction, while the mill, which was made to revolve on the shaft, moved the other way; thus I used the same water twice, by reaction and by direct action. Instead of using one upright trunk around the shaft, I used two, placed a little distance from the shaft, and opposite to each other, which were fastened or connected together, and had a water-course on the top. Above this course was a drum, which was made to move on the shaft by bearings, without moving the shaft with it. The tub-wheel was connected with the shaft, and moved along with it, and a drum on the same shaft immediately above this connected with the mill. By this arrangement, one part of the wheel, with its drum, would move one way, and the other part, with the drum with which it was connected, moved the other way; and by belting from these two drums to a horizontal drum, and crossing the belt in a particular manner, the horizontal shaft and drum would be moved in a single direction from the combined force of these two opposite motions. As the motion of this wheel decreases by increasing its burden, its power is increased by a stronger reaction on the mill, and by a stronger action on wheel.

HIGH-PRESSURE STEAM.

Sir,—In the Mech. Mag. of 13th April last, there is an account of some experiments on steam at high pressure, at which I am not a little surprised. Is C. M. quite sure that no steam escaped during the process of distillation? Did he mark the temperature of the water drawn from steam at the different pressures there stated? If so, I think he would have found out the source of the discrepancy which his experiments exhibit.

DUBITANS.

DYNAMIC APPLICATION OF THE NEWLY DISCOVERED ELECTRO-MAGNETIC INFLUENCE.

Sir,—The prefixed figure represents a dynamic application of the newly discovered electro-magnetic influence. A is an arc of iron, measuring about two-thirds of a circle, and supposed to be armed with the helix of wire, and connected with a galvanic battery in the usual way. N S, S N, &c. is a solid circle, shewing a section of its axis at the centre, and having fixed on its surface the magnets N S, S N, &c. These magnets are built of steel bars, bent so that their straight parts shall incline to each other at an angle of 45°. There are many such bars in each, and the whole compound is firmly fixed on the solid circle, with the straight parts in the direction of its radii. The wires, which form the connexion between the poles of the iron arc and those of the battery, are to be so arranged that the connexion may be interrupted or *reversed* at stated times. Finally, the solid circle is to be so adjusted with respect to the arc, that it will revolve all but in contact with them, and that a line joining them will pass through its centre. The action will take place thus:—Suppose the battery in connexion with the arc, and that any two of the magnetic poles of the circle are within one-third of their common interval, or 15°, of the poles of the arc, since the peculiar arrangement of the magnets ensures the being *always opposite* poles at opposite sides of the circle, the sum of the mutual attractions of the arc and magnets will be exerted in giving rotary motion to the circle. The moving power will continually increase, until the centres of the magnetic poles fall into the line of junction of the arc poles; here the machine must itself interrupt the communication between the arc and the battery. The circle, being supposed so massive as to serve for a fly-wheel, will continue to revolve until the next pair of magnetic poles approach within 15 degrees of the arc poles; here the machine must itself renew the connexion, and if necessary *reverse* it also. The expense of power involved in this suspension and change of the current of electricity will be trifling indeed, as the necessary effect will be produced by the shifting of a few wires, which do not present among themselves any attraction to be overcome; such is the singular nature of this power, it is absolutely latent, except just at the point where you please it should develope its mighty energies. The facility, also, and instantaneous quickness with which it reverses the direction, without impairing the energy of its force, are no less wonderful, paralleled only by the similar qualities of steam. The quantity of power that has been developed by actual experiment with the electro-magnetic apparatus, is so considerable as to leave no doubt of its efficiency as a mechanical agent; there are, however, to be taken into account its strong disposition to concentrate itself, and its rapid decrease in proportion to the distance from the point of developement. Notwithstanding these disadvantages, I should anticipate a satisfactory average of constant working power produced. It may be objected, that a serious check will be sustained by the circle, at the moment of any suspension of the galvanic influence, in consequence of the tendency the magnetic poles would then exert to maintain their places opposite to the arc poles, which, though now inert, are still iron. To this I should answer, that that tendency will bear but a small proportion to the impelling force the moment before exerted, and that this impelling force, being continued by the mass of the circle, will find but little difficulty in overcoming the retarding influence; which, more-

over, being overcome in the first instance, lessens so rapidly (according to the law of the magnetic influence), as to become zero very soon. If, however, the loss of power so sustained should prove equivalent, or nearly so, to the gain made by having the radii magnetic, the difficulty may be at once got rid of by making the radii of unmagnetic iron.

I am sanguine, Mr. Editor, in hoping that some of your contributors will put this matter to the test of experiment.

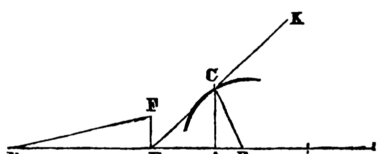
I am, Sir, &c.

φ. μ.

SOLUTIONS OF THE NINTH MATHEMATICAL QUESTION (last vol. p. 158.)

Question.—Given the perimeter and the difference between the perpendicular and base of a right-angled triangle—how to construct it.

By Mr. J. F. Arboleda.



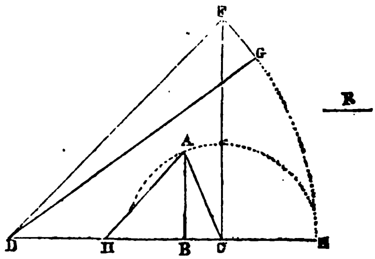
Let DE = perimeter; draw EF pere pendicular to DE, and make EF = to th- given difference between the perpendicular and base. Join DF, prolong DE to G, making EG = DE, and produce DG to N; so that DN·GN = DF². Make GB = GN, and draw EK, making with EN the angle NEK equal to half a right angle, and from the centre B and distance BG describe an arc cutting EK in C; draw CA perpendicular to EB; join BC; then shall ABC be the right angled triangle required.

Because $DE^2 + EF^2 = DF^2 = DN \cdot GN = DN \cdot BG = (DG + BG)\, BG = (DB + 2BG)\, BG = DB \cdot BG + 2BG^2$; add EB^2 to both; then $DE^2 + EF^2 + EB^2 = DB \cdot BG + EB^2 + 2BG^2 = DE^2 + 2BG^2$. Hence $2BG^2$ or $2BC^2 = EB^2 + EF^2$. But CEA being half a right angle EA = AC $\therefore EB = AC + AB \therefore 2BC^2 = (AC + AB)^2 + EF^2$. Again, $2BC^2 = 2AC^2 + 2AB^2 = (AC + AB)^2 + (AC - AB)^2 = (AC + AB)^2 + EF^2 \therefore AC - AB = EF$ equal to the given difference, and $BC + AC + AB = BG + AE + AB = E'G =$ DE, the given perimeter.

J. F. Arboleda.

Mansion House School, Hammersmith.

By Mr. Robert Wailes.



Let DC = perimeter and R = difference of the sides about the right angle. It is required to construct it.

Draw CF perpendicular to DC and = DC. Join DF and draw FG at right angles to DF and = R, and from the centre D and distance DG describe a circle, meeting DC produced in E; make DH = CE, and draw HA parallel to DF, and from the centre C and distance CE describe a circle, meeting HA in A. Join CA, and draw AB perpendicular to DC. ABC will be the triangle required.

Because DC = FC and FCD is a right angle $\therefore$ FDC is half a right angle. But the angle AHB = FDC = half a right angle $\therefore$ HAB is half a right angle, and therefore AB = BH. Now, DH = CE = CA $\therefore AB + BC + AC = DC$. Again, $DF^2 = 2DC^2 \therefore DF^2 + FG^2$ or DG^2 or $DE^2 = 2DC^2 + FG^2 = 2DC^2 + R^2$, but $DE = DC + DH \therefore (DC + DH)^2 = DC^2 + DH^2 + 2DC \cdot DH = 2DC^2 + R^2$ or $DH^2 + 2DC \cdot DH = DC^2 + R^2 = DH^2 + HC^2 + 2DH \cdot HC + R^2$. But $2DC \cdot DH = 2DH \cdot HC + 2H^2$; hence $2DH^2 + 2DH \cdot HC = DH^2 + 2DH \cdot HC + R^2 + HC^2 \therefore 2DH^2 = HC^2 + R^2$ or $2AC^2 = HC^2 + R^2 = (AB + BC)^2 + R^2$. But $(AB + BC)^2 + (AB - BC)^2 = 2AB^2 + 2BC^2 = 2AC^2 \therefore (AB + BC)^2 + (AB - BC)^2 = (AB + BC)^2 + R^2$; hence $(AB - BC)^2 = R^2$ or $AB - BC = R$. Wherefore, &c.

Robert Wailes.

Mansion House School, Hammersmith.

[Answers have been also received from Mylius—Iver Maciver—and T. R.]

ULPHURETTED HYDROGEN GAS.

,—An easy mode of obtaining sul-
ıtted hydrogen has suggested itself
e, which I always adopt when I re-
this gas for experimental purposes.
waste liquor, termed ammoniacal
r, that arises in the manufacture of
gas, consists chiefly of water holding
lution a small quantity of mineral
tha, and a large portion of hydro-
uret of ammonia.

obtain sulphuretted hydrogen it is
necessary to decompose this sulphu-
ammonia, when the combined, or
r condensed, gas is instantly set at
y.

accomplish this, take, say a pint of
oniacal liquor in a quart bottle, to
outh of which should be adapted a
er. Pour into the bottle from 6 to
of strong sulphuric acid, taking
of course, to attach the bladder as
ly as possible. The sulphuret of
nia will be decomposed by the
he latter combining with the am-
, whilst sulphuretted hydrogen will
olved, and ascend into the bladder.
nic acid gas will also be disen-
by the action of the acid; but this
e of very little consequence, unless
ılphuretted hydrogen be intended
ry delicate experiments, and I do
this moment remember any that
ry delicate, where this filthy com-
of hydrogen and sulphur is con-
. I prefer this mode of procuring
ıs in question to that usually re-
ended, because it is neither so
some nor so expensive.

J. O. N. Rutter.

, 1833.

'ALIAN DIRECTION IN MUSIC.

—I have seen lately in the Mech.
many objections raised against the
Italian direction in music, though
eive on no just grounds. That the
of music may be greatly simpli-
am readily willing to admit; but
e use of English, instead of the
ge now employed, would at all
e that object, I greatly doubt.
cially considered, the discarding
, and substituting the national
ge, has a very plausible appear-
out, when closely examined, its
ages will be found to exist in
ınce *only. If the change* were
universally adopted, the inconvenience would be extreme. At present an Englishman can take up a piece of music, whether published in Berlin, Paris, Mantua, Madrid, or St. Petersburgh, and play it with as much facility as if published in his native country: whereas if your proposition were adopted, he must learn a dozen different tongues, take the chance of playing a presto as an andante, an adagio as an allegro, whereby we might know as much from reading the title-page as from playing its contents, or give up foreign music altogether, except through the medium of translation,* which you will bear in mind would be required merely for the purpose of translating the musical direction. This, besides increasing the expense, for which heaven and every music purchaser knows there is no occasion, would, if it did not preclude, greatly delay our acquaintance with works of great, perhaps of the highest excellence.

Who would wish to increase the number of languages? For instance, to make the Irish, Welsh, and Scotch wholly to use tongues unintelligible to the English and each other? Who could wish thus to retard the advancement of that which will finally prove the happiness of all nations—knowledge? Who could be so mad? Yet are the cases precisely similar; and he who would multiply languages in music, would as much put a pause to advancement in the one case as in the other.

One of your correspondents, some six months since, in a letter on the use of foreign words in science, said, "a boy cannot learn to play a tune on the fiddle without learning a language." Did the writer ever try? To be sure a man is not a boy; but your correspondent is more obtuse than his letter would induce us to believe, if he could not play any thing ever composed without learning a hundred words of a language. Many have so learnt, ignorant whether the Italians have three genders or one, whether they lisp with articles, or their alphabet con-

* There are many works, such as the complete works of Mozart, Haydn, Corelli, &c. which are only to be had in foreign editions; in fact, I am not aware of any uniform editions of any author published in England, excepting Handel, and, I think, Dibdin. The edition of Purcell, by Novello, comprehends, I believe, only his sacred works. What should we do in that case? We do not offer encouragement enough to publish them in England.

tains more or less number of letters than the word *pizzicato*.

Trusting these remarks will not be thought to uphold that narrow system of exclusiveness which deserves, and has in your pages received, unreserved reprobation,

I remain, Sir,
Your obedient servant,
VIOLINO.

Tiverton, May 14, 1833.

ON THE POWER OF THE SCREW.

Sir,—Mr. Mallet, in his recent interesting communication to the Mechanics' Magazine on stone-splitting screws, has given a formula for expressing the power of the screw, which I consider erroneous,

for, let $P =$ power of the screw,
$h =$ the distance of two contiguous threads from each other,
$p = 3{\cdot}1416$,
$R =$ length of lever used,
$W =$ power applied.

Then, according to every treatise on mechanics,

$$W : P :: h : 2pR$$
$$\therefore P = \frac{2pRW}{h}.$$

Whereas, in the communication referred to it is said that $P = \frac{hW}{2pR}$, indicating a diminution of energy in direct proportion to the length of the lever used, which is obviously an error.

I am, Sir, yours, &c.,
T.

May 14, 1833.

GAS-LAMPS.

Sir,—Many of your readers will doubtless remember a paragraph that made the usual round of the newspapers a few months since, descriptive of a simple expedient by which glass might be prevented from breaking, through its unequal expansion by heat. The preventive consisted, as was set forth, in scratching, or, as I should suppose, cutting the concave surface of the glass with a diamond. This is by no means a recent discovery; it is not on that account, however, the less valuable.

It happens that, in the town wherein I reside, the gas-lamps are rather smaller *than ordinary; it happens*, also, that the company by whom these lamps are lighted is very liberal, and the burners are therefore supplied with at least 4½ to 5 feet of gas per hour.*

This ample supply of gas, although very beneficial to the passenger, operates somewhat unfavourably on the roofs of the lamps. The truth is, we have scarcely a lamp whose roof is not fractured.

On reading the paragraph above referred to it occurred to me, that if each of the triangular pieces forming the respective portions of the roof of the lamp were in two or more separate pieces, there would probably be sufficient space for expansion without producing a fracture. The same thought occurred to a gentleman in the town, under whose directions the lamps were fixed; and without any previous communication with each other, two lamps were fitted on the same day with roofs divided in the way I have described; one being done by the orders of the gentleman above mentioned, the other at my solicitation. The result is highly satisfactory. From the observations I have made, I think if the roofs of gas-lamps generally were thus put together in separate pieces, it would greatly diminish the annual expense incurred in re-glazing them. Of course, I refer only to those cases where the size of the lamps and the quantum of gas supplied render the roofs liable to break. It sometimes happens that the glazier, in cutting out a fractured glass, has the misfortune to break one or two others; and this is especially the case if the putty be very hard. It is found that putty made with olive oil becomes less indurated under the influence of heat than that made in the ordinary way.

J. O. N. RUTTER.

May 10, 1833.

MR. HYDE'S CASE IN TRIGONOMETRY.

Sir,—Your correspondent, Mr. Charles Hyde, proposed, on May 5, 1832, the following question:—" Wanting to know the height of an object, the first angle of elevation of its top was 29.30. The instrument level with the bottom of the

* I wish the same liberal spirit existed in the metropolis, and some other large towns that I could mention. I have many times noticed a gas-lamp in some of the back-streets of London in which the supply of gas was scarcely 1⅓ foot per hour. It is these abuses that give occasion, and justly so, to complaints against lighting-rates. They afford also facilities to burglars, and such like characters.

object, giving 53¼ feet farther from the object in a direct line. On a declivity the second angle was 3° 45′ to the bottom, and 18° 21′ to the summit, and all the angles were taken in the same vertical plane. Required the height of the object *by two statings*."

Mr. Hyde complains that the writers on trigonometry have not explained how similar questions are to be solved, and hence he infers that there is a deficiency in the rules of plane trigonometry for obtaining the results. All I shall say in answer to this is, that Mr. Hyde has evidently read very few books on the subject, or he never would have made such a remark. Many writers on trigonometry have proposed and solved similar questions, but none of them as yet has been able to make them out by *two statings*; and for the best of all reasons, namely, that the thing is impossible. Mr. E. J. Erichsen, of the Mansion House, Hammersmith, gave what was really an excellent solution of the question, and strictly in accordance with the given data, but without paying attention to the last condition, namely, "that it must be done by *two statings*." Mr. X. Z., of Malmsbury, promised that he would furnish a solution of this *two stating* question; but on second thoughts, I suppose, he found it would require *three statings*, and therefore failed to redeem his pledge. Well, Mr. Editor, such being the case, and no other of your many able mathematical contributors having offered a solution of Mr. Hyde's *two stating* problem, he has been obliged, it would seem, to favour us with a solution of it himself. No, I beg Mr. Hyde's pardon, not a solution of the original *two stating question* (May 5, 1832), but a new one, which he has patched up from Example 3, p. 22, vol. ii. of the Woolwich Course. In this new *two stating* question, which he has truly solved in your Journal of May 11, he has been obliged to call to his assistance *only two new angles* ABE, FCB (see his diagram), which were not given in the original question. In short, he has made it quite a different question from his first. The meanest tyro in trigonometry could not fail in solving his *last* question by two statings.

I am, Sir, your's, &c.

IVER MACIVER.

STRAITH'S TREATISE ON FORTIFICATION.*

France has had more distinguished engineers to boast of than any other country; and it is not surprising, therefore, that the best works extant on fortification should be in the French tongue. Indeed, until the recent works of Colonel Sir John Jones and Colonel Pasley, there was nothing in the English language (of English origin) of the smallest authority in this branch of art. Captain Straith, the Instructor in Practical Engineering and Artillery at the East India Company's Military Seminary, Addiscombe, "having long felt, in common with his pupils, the inconvenience of having to refer to a mass of French authors on the subject," obtained the permission of the Company to prepare the treatise now before us. Captain Straith, however, very modestly disclaims "the name and quality of author," and says he shall be happy if he is but allowed to "deserve the name of a good compiler." To this praise we think Captain Straith is fully entitled. Although he has availed himself largely of the labours of preceding writers—English as well as French—he has done so with a degree of discrimination and judgment which none but a person thoroughly conversant with those scientific principles on which the art of fortification depends, and practically familiar with all its details, could have been able to exercise. The skill with which Captain Straith has managed to free the subject from the heap of "unnecessary technicalities and sounding phrases," or the other words of foreign jargon, with which it has been confessedly overlaid, is in a particular manner deserving of commendation. He commences with a series of "Definitions," in which all the principal terms of the art are reduced into intelligible English; and throughout the remainder of the treatise prefers the employment of English words, wherever the usage of the service will allow of their substitution. We may safely say, therefore, that whether we regard the matter or the manner of Captain Straith's work, the art of fortification has

* A Treatise on Fortification, deduced from established Principles; with Observations on the increased Effect of Artillery. Compiled by HECTOR STRAITH, Captain H. P., Assistant in the Fortification Department, and Instructor in Practical Engineering and Artillery at the Hon. East India Company's Military Seminary, Addiscombe. Annan, Croydon. 409 pp. 8vo. with an Atlas of Plans, Sections, &c.

never been made so plain to English students before.

A treatise on an art so dependent on the principles of mechanics as fortification, must of course contain a great many things that must be of interest to mechanical men of every description, as well as military engineers. Architects, builders, and miners will be especially benefitted by a perusal of the chapters on "revêtements," "casemates and bomb-proofs," "mining and blasting," &c. In treating of Foundations, Captain Straith quotes, with approbation, the description given by Mr. Davy, in the Mechanics' Magazine, of the mode of piling adopted in the erection of Southwark Bridge; but adds, that such a pile-work of timber as was there employed "would in India soon be destroyed by the ravages of the white ant;" and that "for ages edifices have been secured on the sandy soil on the Coromandel coast by resting the walls on wells, which are constructed in the following curious manner, by a *caste* of people called *well-sinkers*:"—

"The ground to be built upon is excavated and cleared away as far as the loose nature of the soil will permit, when it is levelled and the wells are formed and founded on this surface. The wells are of two kinds, of bricks or of pottery; the former about four feet in diameter in the clear, and the latter three feet. Colonel de Haviland, of the Madras Engineers, gives the following account of these wells, as prepared for the foundation of St. Andrew's Church at Madras—a depth of fourteen feet below the surface being excavated and levelled, on which the work was begun:—

"'The process of sinking these wells is as follows:—If of brick, the bricks are made purposely for them, and of a shape to fit each other in their breadth in circular layers, like the voussoirs of an arch, of the usual thickness, and about seven inches long; a little longer as the diameter of the well increases. Before these bricks are laid, a ring of wicker work, of the diameter of the intended well and as broad as the bricks are long, is placed on the surface, and on it the bricks are carefully laid in horizontal layers, with a little clay mortar very liquid between them. A cylindrical wall is thus raised to a convenient height; or, if known, as high above the surface as it may be required to sink the wells below it. The cylinder thus formed is firmly bound together outwardly with hay or straw ropes or twists, wound round it from the bottom to the top; this done, the well-sinker gets into the cylinder with a basket, and with his hands chiefly, when the mud is soft, sometimes with a short-handled hoe and other fit tools, he excavates the soil from the bottom and fills the basket, which is then hauled up by other workmen on scaffolding above, and handed out of the way. In this operation great care must be taken to excavate evenly all round under the wicker ring, that the cylinder may preserve its perpendicularity. The process is thus continued until the cylinder disappears beneath the soil, or until the bottom is found to be of sufficient consistency for the object in view. If the cylinder be not long enough to reach to such a soil, it is raised again and bound round as before, and the well-sinker continues his work till the object, a good soil or rock, is attained. The well is then filled with brick-bats, sand, shingle, small stones, or any other substances which will not dissolve or alter in their volume in water, and will admit of being rammed down to a solid consistency.

"'The wells having been placed as near to each other as practicable, the interstices between them are very limited; but these interstices are also to be filled up and rammed down with the same kind of material as the wells themselves; the whole space is then levelled to an uniform surface, perfectly firm and impenetrable, on which the masonry of the foundation is established.'

"The pottery wells are fitted up and sunk like the others, but the cylinders are formed of baked rings, formed of frames two to three inches thick, and five to six in height, in lieu of bricks. These, however, are seldom used for wells much more than three feet deep; while, on the contrary, wells, even from twelve to fifteen feet in diameter, are often sunk with brick in the way described above, and to a very great depth.*

* "Colonel de Haviland also gives a sketch of the habits and labours of the *well-sinkers' caste*. They intermarry amongst themselves only; they travel about in small companies or families in search of employment, except in such a place as Madras, where they find such constant employment as to induce them to build permanent huts; they work hard, receive high wages, and their constant immersion in water induces them to drink spirits, which leads to improvident habits. While sinking the wells, almost in a state of nakedness they continue at their work, although the water gains upon them, by diving beneath and remaining below a considerable time. Baling the water continually would not only be very expensive with their simple contrivances, but by the process of doing so the water would find its way between the interstices of the bricks, would wash away the mortar, and derange the cylinder, which would then fall in. In pottery wells, however, it must be done, as the sinker is embarrassed for room. The exertion of working is great, so that they relieve each other frequently."

"In further describing the foundation of St. Andrew's Church, Colonel de Haviland says that 'the wells were sunk about nine feet, the foundations being raised about thirteen feet and a quarter above that, and a basement of four feet more, made the whole depth below the pavement about twenty-six feet and a quarter. But even at this depth the soil was still of the nature of *quicksand*, and to appearance not very solid; but it was a *sand*, a substance that would not dissolve or alter its volume. But the whole area being uniformly the same, no apprehension was entertained of the result, as each part would be sustained in equilibrio.' And St. Andrew's Church, built in 1818, stands firmly on its bed of wells.

"The wells of this edifice, as also those under nearly all the buildings about Madras, and the revêtement-walls of Fort St. George, rest upon sand; and their stability affords a proof of the correctness of the opinion expressed by Mr. Davy, 'that although the feet of the piles rest upon no other security than clay, a pile of ten or twenty feet long, driven down, will, by the friction of its sides, have a hold on the ground nearly in proportion to its actual superficies,' more especially when rendered solid, as in the Indian modes of ramming the spaces between the wells with dry rubbish for so great a depth."

An Appendix to Captain Straith's Treatise contains a very able paper on the pressure of earth against revêtement-walls, supplied by Mr. Samuel Parlour, one of the mathematical masters at Addiscombe. Mr. Parlour was induced to undertake the investigation of this part of the subject in consequence of a remark made by Colonel Pasley, in his work on Fortification, that no satisfactory theory of it had yet been furnished. The mathematical results obtained by Mr. Parlour are stated to correspond very nearly not only with the actual dimensions of all the revêtement-walls constructed by the celebrated Vauban, with a single exception, but also with a series of experiments recently made at Addiscombe.

THE COINAGE.

Sir,—I must claim half a column for a word or two more on the coinage question, called for by your last remarks.

It is strange that a charge of "verbal quibbling" should be brought by one who, in the same sentence, calls in "legal parlance" to his aid. In "legal parlance," a strapping young *fellow of twenty* is an "*infant.*" *The bargain* for an irredeemable annuity would be complete as soon as the money was paid; the annuity itself would as evidently *never* come to an end.

If the Act making the alteration had a clause, that in old contracts "wherever copper money was mentioned, it should be taken that the same amount and $\frac{1}{24}$ of the new coin was intended"—I do not see how an "infinity of cases" could escape.

"$+ 10\frac{3}{4}d.$" is not "$\times 10\frac{3}{4}d.$"

You say, "certain it is that the product of $\frac{750}{12\frac{1}{2}}$ is 59*s.* $10\frac{3}{4}d.$" I am egregiously mistaken if it be not 60*s.* = £3, neither more nor less. There must, therefore, be a want of comprehension on this point *somewhere.*

Finally, I must reiterate that you have not yet adduced any proof of the proposition you profess to defend, *i.e.* that by the "*proposed alteration there would cause a confiscation of* 4 *per cent. on every fixed payment.*" Your last sentence, indeed, goes far towards giving up the question.

I remain, yours, &c.,

F. H.

Londay, May 2, 1833.

[We meditated nothing less than "giving up the question;" and still abide by the opinion we originally expressed—subject to the correction stated in our remarks on F. H.'s first letter. But that we may not by any further observation of ours prolong a controversy which must have already sufficiently taxed the patience of our readers, we shall content ourselves, by way of general and final reply, with requesting those (if any there be) who still doubt the correctness of our views on the subject, to read again what we have said upon it, and to give us credit for no more than F. H. has been unable, with all his acuteness and all his pertinacity, to disprove. —Ed. M. M.]

Bread Test.—Professor Kuhlmann, of Lisle, in a Memoir on the Adulteration of Bread with Sulphate of Copper (blue vitriol), which he states to be universally employed by bakers for the purpose of making bread light and porous (although seldom in a greater proportion than one grain to seven pounds and a half—a quantity too small to occasion any serious alarm), furnishes the following simple method of detecting its presence. Pour a drop of the prussiate of potash on a piece of the suspected bread; and if it contain any sulphate of copper—even as small a portion as one in nine thousand—the bread will assume in a few seconds a decided rose colour.

Copper in Wheat.—M. Sarzeau, a French chemist, has ascertained that copper forms one of the constituent elements of wheat, but that it is confined to the outer shell of the grain, and that of course the more bran any flour contains the more coppery it must be! Let not the lovers of household and brown bread, however, be alarmed at this discovery; for, according to M. Sarzeau, the quantity is so small that a man cannot swallow more than a couple of grains in the course of a twelvemonth. The aggregate results are, nevertheless, sufficiently striking. M. Sarzeau calculates that the French nation must in this way eat 10 kilogrammes of copper every day, and that the wheat crops must annually extract from the soil of France 24,000 kilog. of copper!

Calculating-Machines.—Sir, I take advantage of the first spare half hour I have had since seeing the friendly suggestion of your correspondent $\phi.\ \mu.$ (p. 85), to assure him that my undertaking is a matter purely and solely of mental achievement; to be taken as an effort among innumerable others which your pages have recorded, to prove what may be done without the valuable though expensive aid of experiment. I have brought the subject through all its difficulties, so far as I can see, without hand-labour. To your readers generally some apology appears necessary, on account of the delay in presenting my scheme, because I promised on the 11th March "to lay it before them shortly." I had at that time brought to a conclusion all the calculations necessary, some of them rather intricate; and being then out of work, with an expectation of remaining so for a month or two, I reckoned on having sufficient leisure for the performance of my promise. *Unfortunately*, however, I obtained employment earlier. The workshop is four miles from my residence, the work is required to be finished in a limited time, the hours of labour are more than the usual number, and, altogether, I am on my legs from half past four in the morning till half past nine at night, with the exception of two hours for meals. Of course, there is but little leisure remaining, and that little I am under the necessity of devoting to my family. I must, therefore, defer describing my proposed machinery until winter evenings, and perhaps now and then a winter day may give me the leisure required. In the mean time it may be as well to state how much my machine will accomplish, begging, what may be considered, with the present capabilities of mechanics, a small postulate—that the workmanship can be executed with the requisite accuracy. It will lay down series of logarithms of all kinds, and will point out their moduli; it will be found an excellent illustration of that principle of logarithms on which the demonstration of the locus of a modulus is founded, as also of the doctrine of fluxions in general. It will lay down series of powers and roots. It will solve equations where they are rational, and point out to what extent they are irrational. These are a few of the things to which I have directed my attention. But there is another object which my machine will accomplish, which has not, so far as I know, been attempted hitherto by machinery. It will extract the root of an exponential equation of the first order, where the index is the same as the root, as $x^x = 100$. It will also point out the range of the roots of exponential equations of higher orders.—I remain, Mr. Editor, your most obedient servant, SAMUEL DOWNING. May 20, 1833.

The Messrs. Stephenson and the Undulating Railway.—"A Subscriber to the Birmingham Railway," is "anxious it should be made known that though Mr. Stephenson, sen. is a convert to Mr. Badnall's undulating theory, Mr. Stephenson, jun., who has the active management of that railway, has expressed a decidedly opposite opinion." It is but fair, however, to Mr. Badnall to observe, that such things have been, as agreeing to differ, from mere prudential motives. In the rebellious times of Scotland, nothing was more common than to see father and son espousing opposite sides, for no other reason than that, come what might, the *family interest* should still be safe.

How to Variegate or Water Brass.—Immerse the brass article in a boiling solution of sulphate of copper, and a crystallisation will take place analogous to watering, but more beautiful because it reflects more light. Some brasses assume the appearance of porphyry, others of granite, with various shades, according to the proportions of zinc and copper which they contain. In some instances, an article will assume a deep red colour or dark violet, without giving any reflection; but if carefully washed a white dust will be formed on its surface, and after a slight rubbing with varnish the desired appearance will be produced. A few small iron nails left in the solution quickens the operation considerably. One pound of sulphuric acid to two of water will be found in general to form a solution of sufficient strength.—*Journal des Con. Usuelles.*

Arundel Castle; Amateur Builders.—Arundel Castle was for many years the scene of the late Duke of Norfolk's trials at building, by which, as his own architect, he sought to instruct himself in the Gothic style. After being occupied in this way for upwards of forty years, and spending several hundred thousand pounds, he just arrived at last at that point where a man discovers his own utter ignorance. We make no reflection on the memory of the noble Duke on this account—we merely state a fact. A man of overgrown wealth may be allowed to spend it in any way he pleases, as the greatest injury he can do society is to hoard it. Had the Duke employed an architect, he would no doubt have possessed a castle in very superior taste, both externally and internally, to what Arundel Castle now is; but it does not follow on that account that he would have been so happy in seeing the more perfect works of his architect as he was in realising the crude ideas of his own mind.—*Loudon's Cottage, Farm, and Villa Architecture; last and concluding Part.*

Hint to Gas Burners.—It should always be remembered in estimating the cost of gas-light, to take into account the intensity of light, as well as the quantity of gas. Persons who have been accustomed to burn only one, or at the most, two candles in their shop or other apartment, are not commonly satisfied with the same quantity of light from a gas-burner when it canso conveniently be made to yield them more. We have known instances, in which there have been four and a half feet per hour consumed during four hours a night, and after a few weeks a complaint made that gas was more expensive than candles! No wonder that it should, when more light had been employed in one night than had formerly been obtained from candles in ten or twelve nights. It rarely happens that the additional expense for gas-light, if there be any, is grudged, even by those whose cost for candles had been a mere trifle, when it is found that the gas affords not only any quantity of light that may be needed, but that it also diffuses a degree of warmth throughout the apartment, which supplies, in some respects, the place of a fire.—*Rutter's Gas-Lighting.*

INTERIM NOTICES.

We recommend to R. T. L. to wait the result of the Bill now pending for the amendment of the Patent Laws. His secret shall be safe with us in the meanwhile.

A. will find something on the subject he mentions in almost every Number of our work for the last twelvemonth.

Y. Z. must be more explicit to enable us to be of any service to his friend.

Communications received from J. P. N.—Mr. Whitelaw—F. O.—Pinion—J. C. R.—T. B. D.—M.—Mr. Bowie—An Operative—S. D.

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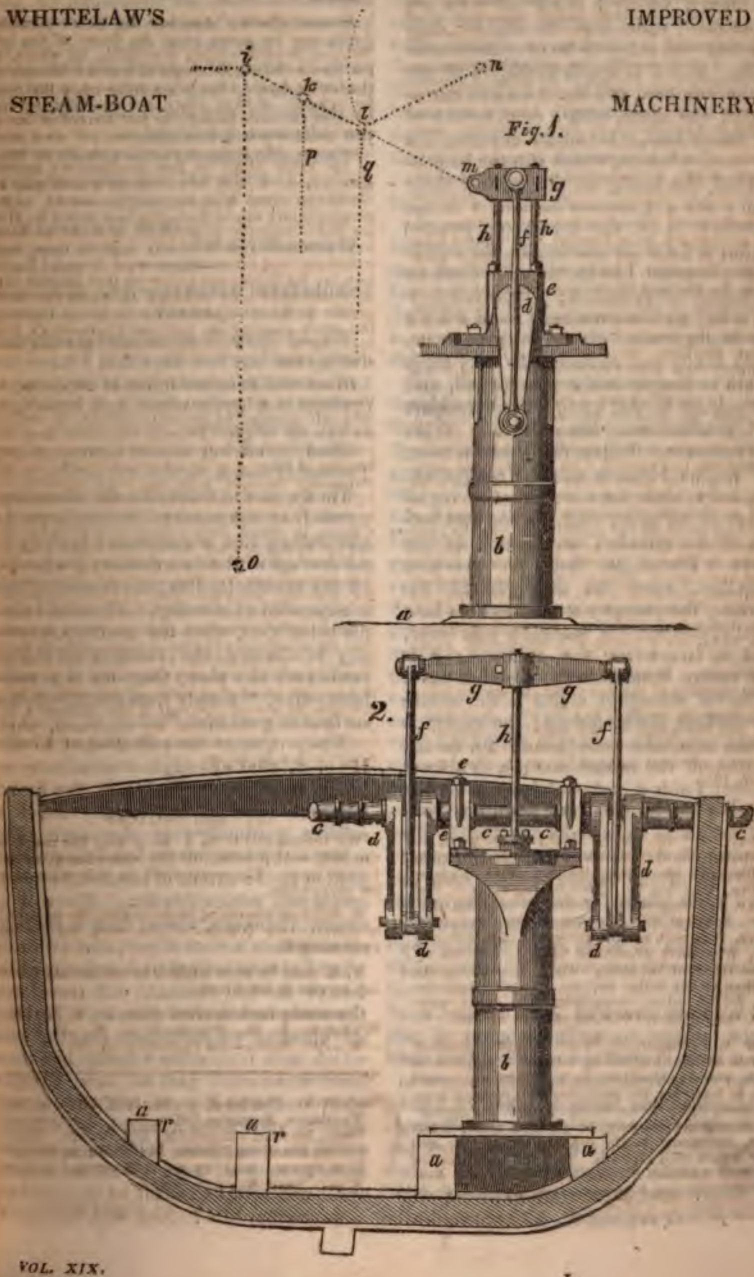
WHITELAW'S IMPROVED STEAM-BOAT MACHINERY.



IMPROVEMENTS IN STEAM-BOAT MACHINERY.

Sir,—The accompanying sketches exhibit some improvements in steam-boat machinery, which I think all who are acquainted with this branch of construction will allow to be of considerable value. Fig. 1 is a side elevation of one of the engines, and fig. 2 an end elevation of the same, with a cross section of the entire boat. In both elevations, *a a* are wooden beams, which run the lengthway of the boat; on the tops of these beams the engines are bolted; *b* is the cylinder; *c c c c* the crank (or paddle) shafts; *d d d d* the cranks; *e e* the crank-shaft plummet blocks, they are fixed on the top of the cylinders; *f f* the connecting rods; *g g* the cross head; and *h h* the *two* piston rods, which work past the crank shaft, *one on each side*. By these means a longer stroke is obtained, and the engine is put up in a more *compact* and *steadier* way than in any other arrangement. When the stroke is long, the engine is more easily wrought expansively, and there is a great saving of steam in the ports, and the top and bottom of the cylinder, at the turn of the stroke. The *dotted lines*, in the side elevation, shew an arrangement for working the pumps; it also answers for a parallel motion. A *malleable iron* lever, *i k l m*, turns on the centre *i; k* is the centre from which the hot-water pump is wrought; and *l* is the centre for working the air-pump; the centre *m* works into the cross head; *l n* is the position of the radius bars; *n* is a fixed centre; *i o* is a rod, which works on the centre *o* like an inverted pendulum; *p* is the hot-water pump rod; and *q* is the air-pump rod. It will be kept in mind that one of the engines only is seen in fig. 2; the place for the other engine is shewn at *r r*. The cross head might be shorter than it is in the figures, by making the cranks work closer to the cylinder.

In locomotive and some other engines, where the cylinder cover is at the different end of the cylinder from the piston rods, the cranks might be made to work quite close to the cylinder. All the parts about an engine of this sort, being so very light, it may be made to work at a greater velocity than one of the common kind, and a smaller cylinder will give the power required. The short shaft above the cylinder can easily be lifted out of its place when the piston is packed; if a metallic piston is used there is seldom need for looking at it. In large steam-boats the stroke can be had long enough without having the cylinder cover so close to the shaft. If the air pump is wrought through the bottom of the cylinder, as long a stroke may be had in this as in any steam-boat engine of the ordinary construction.

Insert the above in your valuable Magazine, and you will very much oblige,

Your's truly,

James Whitelaw.

Glasgow, May 9, 1833.

UNDULATING RAILWAY—MR. BADNALL'S REPLY.

Sir,—I have been so much occupied during the last few days that I have not had an earlier opportunity of replying to the four last letters which you have published on this subject.

First, in answer to your correspondent, T——s H——d.

He appears to think that the advantage arises from the carriage attaining on the undulating line a maximum velocity at the bottom of the first descent; whereas, on the horizontal line, considerable time is expended at starting. He also states his belief that, when the maximum velocity is attained, the carriage will travel farther on the plane than on the undulating line, "simply because it has less surface to pass over."

Now, it must be self-evident to Mr. H——d, that although a maximum velocity might be attainable at the foot of the first descent, that velocity ought to subside gradually up the succeeding ascent—the momentum left being in proportion to the extent of locomotive power employed, minus friction. He will no doubt, therefore, allow that a carriage starting from a state of rest, and attaining what he terms a maximum velocity at the foot of the first descent, will travel over the curve in less time than on a horizontal plane of proportionate length, upon which such maximum velocity has never been attained. Let us now consider what would be the result if the carriage were to start upon a curve, at what he considers a *maximum* velocity, instead of from a state of rest. Will he dispute that such velocity *cannot* be increased on a horizontal line? And will he dispute

ıpon a regular curve it *must* in- down the descent, according to the f falling bodies, and rise the suc- ıg ascent at the same *average* velo- If he allow this, he cannot possi- ny that *at whatever velocity a car- commences its progress upon a it must traverse that curve in less han on a horizontal plane of pro- iate length*, meaning by *propor-* ; such a length of line as would be to the direct distance between the ghest points of the curve.

H——d, by way of proving the ıcy of my principle or otherwise, mends the trial of an interesting ment.

r, the very experiment to which he s has been repeatedly tried in the ıce of the Messrs. Stephenson, Mr. , and many other engineers, and ult has always been that when the l carriage, descending a steep in- plane before commencing pro- ıpon either railway, fell by its own y alone, it traversed a much greater ce on the undulating than on the ntal line in the same space of time; hen the engine was *equally wound* each railway, and *equally loaded*, g from the summit of the inclined the same result took place. The experiment was frequently tried at ıester in the following manner:—

precise spot was ascertained on rizontal plane from which the en- ould be wound so as to admit of a being employed *exactly* able to r a load of 56lbs. from the top of lined plane, rising 4 inches in 8 o the extremity of the line, which feet on the perfect level, at which ity the momentum entirely ceased. engine was then wound up on the ntal plane from precisely the same nd carefully conveyed to the top of lar inclined plane on the undulat- ilway; and it was invariably found traversed the latter line in consi- y less time than the former, having *extremity* sufficient momentum left y it off the road.

ıust also remark, that the undue which Mr. H——d considers was to the curved line by the spring wound up further upon it than he horizontal line, has throughout the whole experiments been carefully avoided, inasmuch as the engine having been wound up by being drawn back- wards on the horizontal line, was carried from thence to the undulating line *in every instance* where a perfectly correct experiment was required. I have, there- fore, no hesitation in affirming that Mr. H——d will find, if he have sufficient leisure to try the experiments, that "the *longer way* is (as to time) the *shorter*— the more uneven the easier road."

Secondly, in reference to the first com- munication of S. D.

I consider his remarks to be of some importance, inasmuch as they present a new feature in opposition; and if he al- low that velocity accumulates on an un- dulating road in a greater ratio than on a level road, he brings the argument to the simple question, *why?*

He considers this is owing to the spring unfolding faster down the first plane than on the level, and consequently to the impetus in the spring increasing in a greater ratio in the one case than in the other. But, let me ask, ought not this advantage to be negatived in the ascent? Upon the level plane the acceleration is gradual and constant until a maximum velocity is attained; and so upon the un- dulating plane the *average* acceleration is gradual and constant until a maximum *average* velocity is attained. For al- though down the first descent a velocity equal to the average maximum velocity may be gained, it is a question with some very intelligent engineers whether on the apex of the succeeding ascent the velo- city is not *precisely equal to the velocity at the very same point of distance on the level plane*; the advantage in this case being that the entire distance has been traversed with the same expense of power *in very much less time*. Again, the power of the spring cannot possibly increase during the progress of the carriage along *either plane*, inasmuch as the action of the power is regulated by a conical fusee. In whatever way, however, the power may be supposed to act, it must inevita- ble act alike on each railway.

Now, whether spring power be em- ployed or not, the result would be pre- cisely the same. If we start a steam- engine on a horizontal line, whose wheels are 5 feet diameter, the piston would work 55 strokes per minute to maintain a velocity of 10 miles per hour. But if, in

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' *See my Treatise, p. 121 and 122.*

going down the descending line of a curve, the velocity is so accumulated as to enable the piston to work upon an average of 110 strokes per minute, which (or at a much greater rate) it is enabled to do effectually, the momentum at the bottom of the descent will be in proportion to the amount of power employed in addition to the amount of the accumulated force of gravity. Hence, such is the accumulated velocity, that if the power were no longer exercised than to the lowest point of descent, the succeeding ascent would be made in the same time as the descent, *if the curve were regular*, and much more rapidly if the ascent, though steeper, were considerably shorter than the descent; for the time required to *generate* any given velocity on a curve depends upon the length and depth of the descending plane—and the time required to *expend* any given velocity on a curve depends on the length and depth of the ascending plane, whatever be the power employed. But I may be asked, what would be the advantage of an undulated road when a *sufficient* maximum velocity were *attained* on a horizontal railway? You need not travel faster than 200 strokes of the piston per minute? Very true; but on a horizontal line the steam power must *constantly* be exercised to maintain this velocity, or the momentum acquired would instantly begin to diminish—whereas on the curve momentum is so easily acquired by the combined powers of steam and gravity, that without diminishing the average velocity of 200 strokes per minute, the steam *need not be employed* throughout the whole length of each undulation. But the advantage will be more evident when *very heavy loads* are attached to the engine. It cannot *then* travel at the rate of 35 miles per hour on a horizontal railway, *but if it can move at all on the level*, and even when it *cannot move on the level*, it can travel that average speed on an undulating railway without difficulty, the extent of speed entirely depending on the length and depth of curve,—the fact last stated being (in principle) most decidedly proved by the experiments.

S. D. also states his belief that the success attendant upon my experiments is in part owing "to the action of the spring on the axle being continual and unremitting, whatever the velocity with *which the wheels revolve*." But is not the action of the spring on the a cisely the same on both railway can it be disputed that precis same amount of power is expend both railways?

I now turn to my first o Junius Redivivus.

His remarks are in a great answered by my previous .obser I will, however, particularly in to try, if he can find leisure, one ment at the Adelaide Rooms, wl speaking either to Mr. Watson Perkins, he will, I am sure, have portunity of doing. He will ther horizontal railway and two un railways, each 60 feet in length; mer on a dead level—one of tl inclining about 1 in 94, and th also on a dead level. Now, if wind up the carriage by drawing wards along the horizontal line, it with 14lbs., he will find tha traverse the whole distance in a seconds. Let him then wind spring a second time upon the ho line and carefully convey it to th the undulating inclined plane. he find that (precisely the sam being expended) the carriage verse the entire length of the plane of 1 in 94 in the *same ti* the horizontal road, and, moreov find that (the same amount of p ing employed) the carriage wil 28lbs. along the level undulating precisely the *same time*—I hope either feel inclined to acknowled says, *the triumph of the principle*, individual evidently capably of r well, point out the fallacy. I with pleasure have two railways meet his own proposed experime think the expense quite unnec long as the result already shown uncontroverted, and more espe the public will shortly have an nity, on a practical scale, of fo decided judgment.

Junius Redivivus is evident taken as to the manner in wl moving power acts. He is prob aware that the fusee, as before c is conical, and therefore regul equalises the power of the sp though the fact of its being wou the same exact tension for each is in itself an answer to his d this head, as well as to the writ

Magazine edited by the Messrs. Cobbett, whose remarks I have not seen. It may also be worth remarking, that the difference in the absolute length of any curve likely to be made practically available; and the length of a horizontal line drawn direct from one apex to the other of such curve, is altogether unimportant. For instance, upon a practical scale, to which I shall refer in my next communication, it will be seen that where the horizontal line upon a railway is 1,493 yards in length, the length of a curve dropping 31 feet from the level, rising again to the same level, and extending from one extremity of the horizontal line to the other, is only 1.508 yards,' shewing a difference only of 15 yards in the entire length.

Junius Redivivus also inquires why, in p. 84 (see p. 81,) the *limited* power I employed in trying the difference in momentum was so small? He must recollect that my railways were only 32 feet in length, and when my spring was wound up 10 feet (see p. 82,) the engine travelled nearly the whole length of the curved line. Had I, therefore, wound it up 11 feet, the difference in momentum could not have been measured.

It is true that these experiments have been tried on a small scale, but I could not conveniently have tried them on a larger in the first instance. In Manchester, however, my model railways were 50 feet in length, and in London 60 feet, and the accuracy with which the published experiments were tried is proved by the comparative result upon the other railways. I think it also expedient to mention that, upon the Manchester models, the carriage was allowed to traverse a curve exactly similar to the first curve on the undulating lines, before commencing its progress upon the horizontal plane. This was done to meet the objection of there being an advantage in the *first start* upon the curved road; and upon the models in London, to meet the same objection, a level of 6 feet is assigned to each railway, in order that the carriages might all commence at equal velocities.

In allusion to all the experiments, and to the construction of both the engine and railways, as well as to the levelling of the latter, I can most conscientiously declare that it has, from the first, been my chief aim to avoid self-deception, and by doing this I as conscientiously believe that I have not imposed upon the public an idle and unprofitable subject of discussion.

Proceeding to the second communication of S. D., he appears altogether to misinterpret my reasoning. When I say, that "throughout the ascent the pressure upon the rails, and consequently the amount of friction, is precisely the same as it was in the descent A B, viz. as much less than it was on the horizontal line E A, as the line C D to D G," I mean, that as C D is in proportion to D G, (or to CP, which is the same thing, C P and D G being parallel lines,) so is the one force precisely to the other; C D representing the portion of the weight taken *off* the rails owing to the inclination of the line, and C P or D G the amount of pressure *on* the rails.

Now C D does not represent, as stated by your correspondent, an *augmentation* of friction up the ascent, but, as in the descent, an absolute *saving* of friction. It is true that it represents the opposing force of gravity up the ascent, and an assisting force in the descent; but these forces are altogether distinct from friction, the force of pressure denoted by the line C P, and consequently the amount of friction, being precisely the same on each line, and on both considerably less than on the horizontal line E A, as explained in my Treatise, p. 114.

Thus, if the carriage press upon the horizontal line E A with a force equal to 5 tons, and if C D be equal to $\frac{1}{5}$th of the force C P, the amount of pressure upon the rails, either on the ascending or descending plane, is only 4 tons.

This position will, I have no doubt, be found by S. D., on further consideration, to be mathematically correct.

Having thus fully replied to your correspondents, I cannot help expressing my surprise that, as yet, I have not found one individual who endeavours, upon mathematical principles, to substantiate a fallacy, or to prove *why* a *level* line is preferable to a *curved* line. When a man boldly publishes an opinion, I will say, in direct contradiction to all received theory, and when he establishes that opinion by, what he has a right to consider, the unerring test of experiment, it appears to me a stong proof of the accu-

racy of his doctrine, if, in the present advanced state of science, it remains unopposed by mathematical reasoning.

Hoping that I shall not be accused of arrogance, and much less in a matter of this extreme interest, of any ridiculous feeling of vanity, but solely from a desire to call the attention of scientific men to this subject, upon which the expenditure, probably, of millions depends, (for I have no doubt, if the principle which I advocate be correct, that the estimated expense of the projected railway from London to Liverpool may be reduced at least $\frac{1}{3}$,) I will take this opportunity of making your Magazine the medium of a public challenge to the scientific world, upon the result of which I freely risk my future chance of mechanical reputation. In doing this I again repeat my hope that my motive will shield me from the unjust accusation of impertinence, and that the *immediate* necessity existing, on account of projected railways, that this question should be determined, will warrant me, in the eye of the public, for thus unceremoniously throwing a gauntlet, which, under any other circumstances, I should have withheld.

In pursuance, therefore, of this determination, I challenge any scientific man in Europe to disprove, *by mathematical reasoning, or by experiment, that a carriage of any given weight, and propelled or dragged by any given power, will traverse a curve of any given dimensions, whose two summits are of like altitude, in less time than the same carriage, propelled or dragged by the same power, will traverse a horizontal line of a length proportionate to the direct distance between the two highest points of the said curve, provided always that the average angle of inclination, either of the ascending or descending lines of the curve, shall not exceed an angle of* 45 *degrees,* nor the entire length of the curve be too limited to admit of the free passage of the carriage, the surface of the horizontal plane and of the curved line being precisely alike.*

And I moreover challenge any scientific man in Europe to disprove, *either by mathematical reasoning, or by experiment, that a carriage propelled or dragged by locomotive power, will traverse the whole extent of such before-mentioned curve with facility, and with a load wh same power could not move on a ho plane of like surface.*

* My reason for limiting the angle to 45 degrees will be explained in my next communication.

Now in order to render my v regard to the practical operati locomotive engine upon an un line, better understood, and witl of shewing the immense saving expense of railway making, whi result from the adoption of the which I advocate, if that sys correct, I will, in the course o days, send to you a section of line of road upon which, by the the directors of the Liverpool an chester railway, I have denoted t most likely, in my opinion, to p such line the efficacy of the prin question.

This section will be accompanie remarks which I have embodied in to the Board of Directors, with su observations as I consider likely t interesting to your readers, and to interested in railway property. clusion, I cannot help expressing that the subject of this commun may prove deserving of the atten the Mathematical Professors an dents of our different Colleges, as of the many Scientific Societies i don and abroad, persuaded, as that a more important theory (if I in error) could not, as affecti hitherto acknowledged laws of and friction, be submitted to th liberation.

I am, Sir,
Your very obedient servant
RICHARD BADN

Liverpool, May 31, 1833.

HEAT A PECULIAR MODIFICATIO ELECTRIC MATTER.

Sir,—Having in former letters i useful work been led to the con that heat is an element—that it bination with other elements in v proportions produces distinct for matter—that its peculiar properti only latent, and not extinct, whe cealed by combination with other —I shall now endeavour to shev heat is a peculiar modification of tric matter.

To prove this position, let us tr either common or galvanic ele through two long, insulated, fine

or platina wires, into any insulated glass vessel, containing pure water. The water will be decomposed, will enter into chemical combination with the electric fluid, and be transformed into and expanded into oxygen and hydrogen gases of 2,000 times the volume of the water, of permanent elasticity, at atmospheric pressure, at any degree of cold.

If the electric spark be passed through these gases, or if the gases be subjected to violent and sudden compression, they will explode, and be resolved into water, heat, and light.

If these gases be slowly burned in a proper vessel they contract into $\frac{1}{2000}$ part of their volume. The water is recomposed of its original weight, volume, and purity, and five times as much heat, accompanied with brilliant light, is separated from the gases as would have converted the water into steam.

Now as nothing but the electric fluid will pass through extended, insulated, metallic wires, and decompose the incombustible fluid, water, in an insulated glass vessel, and expand it into 2,000 volumes, so nothing but the electric fluid can have entered the water, and have transformed and have expanded the incombustible water into 2,000 volumes of combustible gas.

As, in burning the gases, heat and light, in great quantity, were separated from the water, which remained in its original weight, volume, and purity, the inference is unavoidable, that heat and light are mere modifications of the electric fluid, as that fluid alone has been transmitted and combined with the water to form the gases.

Now a patient consideration of these experiments will shew them to be very comprehensive assistants in investigating the nature of heat, light, and electric fluid; and these experiments will also be found accurate and severe tests of the truth of the various philosophical theories that have been advanced on all those subjects.

Let us first compare the theory advanced by Lavoisier, that all the heat evolved in combustion is evolved from the oxygen gas, and none from the combustible or from the hydrogen gas: let us compare this theory with the facts observed in the expansion of water into 2,000 volumes of permanent gases, by chemical *union of water and caloric* or heat. *We must then perceive how* inadequate is Lavoisier's theory to explain the fact of the gaseous expansion of the hydrogen of the water, which is evidently as much a chemical compound of caloric and hydrogen as oxygen gas is of caloric and oxygen; and as each element equally requires caloric for expansion and for separate existence in the gaseous state, so, like all other elementary definite combinations, each must part with and contribute their quota of heat when they recombine and reform water.

This theory of Lavoisier's has been found equally unsatisfactory and inadequate to explain the source of animal heat. This theory derives all the heat from the decomposition of oxygen gas, and its resolution into carbonic acid gas. But, unfortunately for this theory, it has been found that the heat latent in carbonic gas is equal, or nearly equal, to that latent in oxygen gas; it is, therefore, necessary to allow that the heat in respiration must be equally evolved from the carbon as from the oxygen gas during their chemical union in the lungs.

There is yet another theory on heat, equally plausible and equally unsatisfactory, although it is exceedingly general and almost undisputed amongst chemical philosophers—it is this, that heat is always evolved by, and is always the result of condensation, as of vapours or gases condensing into fluids, or fluids condensing into solids.

Both these current theories are, however, not only inadequate to explain, but are positively contradicted by numerous facts familiar to every one. Look at the instantaneous vaporisation of flint and steel in collision under water. Look at the expansion of a cold solid, of one volume of gunpowder, into 2,000 volumes of red-hot gases and vapour. Look at the similar expansion of all the solid or liquid fulminates, all which are the very reverse of these generally received theories.

Now, for these unsatisfactory, inadequate, and contradictory theories of heat, we require the substitution of some one theory, that will embrace and correspond with all known facts, and that is not and cannot be contradicted by any fact; for whatever theory is contradicted by a single direct fact ought to be thenceforth considered unsound and delusive.

We now possess data on which to found a more satisfactory, general theory of heat.

For having found that heat is an ele

ment, and having been taught by our illustrious countryman, Dalton, that all elementary substances combine in definite proportions only, it follows that heat combines in definite proportions only with other elements; and whenever any elements chemically combine, with which elements heat is already in chemical combination, the heat, in combination with the other elements, is of necessity liberated and evolved.

Now, as it has been observed, that heat may be evolved from all substances found in nature, or separated by art, it follows that all substances in nature, however simple they may have been hitherto deemed, are compounds of heat and simpler elementary substances.

As heat is merely a modification of electric matter, it thence follows that all substances in nature are compounds of electric matter, and simpler elementary substances.

It follows, from all the phenomena of electricity with which we have become acquainted by means of experiments with the galvanic or electric machines, that heat is a compound of two electric fluids, equally energetic, but of perfectly opposite properties.

Heat seems never to be the result of the action, however energetic, of either of these two fluids; for, however highly an electric battery may be charged with either electricity, it manifests no heat to the most delicate thermometer, nor does an insulated person experience any sensation of heat, however highly charged with either electricity.

It thence results that heat is a compound element, but the most simple of any other elementary substance we find in nature. The metals, for instance, are at least triple elementary compounds. In my next I shall endeavour to confirm these views by a narration of some experiments made for that specific purpose, and to inquire into the value of our electrical theories, which I consider as untenable as those hitherto generally advanced on heat.

Yours, &c. C. M.

SWIMMING SHOES.

Sir,—I have observed amongst those who are fond of the amusement of swimming, much exertion is used to propel *the body over the distance* accomplished, *which, even with the most* skilful, is very inconsiderable. The reason obviously is, that the human foot does not afford a sufficient surface to act upon the water, for we find that the best swimmers derive some assistance from a peculiar turn of the leg, which brings the outer surface of the leg and thigh to afford resistance to the stroke, and it is also known that several persons remarkable for their skill in swimming have been deformed or crooked in the legs. I do not know whether any attempt has been made to give man a web foot, but the experience of the disadvantages above noticed suggested to me the possibility of constructing an appendage for the foot, to render swimming easy and rapid. The following sketches will, I think, explain my idea:—

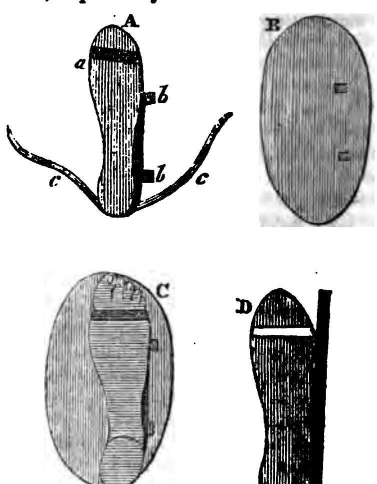


Fig. A is intended to represent a light sole, of wood or leather, having a broad strap of leather at *a*, so fixed as conveniently to admit the toes, two straps, *c c*, to fasten round the ancle, and on its outer edge two hinges, *b b*, which may be of leather or metal. By means of these hinges the oval piece of wood B must be fixed to the sole A, at points out of the centre of the oval by half the breadth of the sole, and in such a manner as that the oval A may hang with a slight tendency to close flat upon the sole. The stiffness of the hinge of leather will sufficiently give this tendency. I proceed to explain the action. The oval B hanging by points out of the centre will have the action of a vane, and when drawn

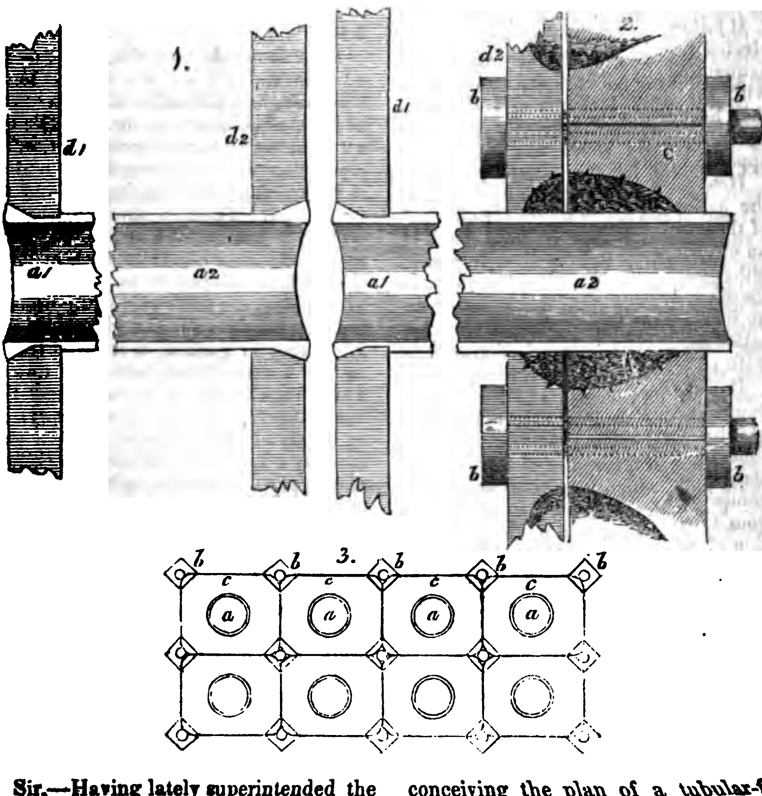
through the water will present its edge, so as to offer little or no resistance to the swimmer in drawing up his legs to make a stroke. Its position is shown in fig. D. When the swimmer has drawn up his legs to their extent of contraction he forces back his feet, and the oval B immediately closes flat upon the sole, giving a resisting surface, which may be increased or diminished by enlarging or contracting the size of the oval. It will probably be found, that about twice the surface of the foot will be amply sufficient. The fig. C shows the position of the oval B during the stroke.

I have not made any attempt in the water with this appendage, and therefore cannot say what difficulties may arise. If you think the idea worth communicating to your readers, you will please to add a few cautions, which appear necessary in any attempt to swim with these appendages. First, the wood, or the wood and metal, must be such as that it may have no tendency to float. The using of a light wood by a weak swimmer would probably have the unpleasant effect of turning him heels uppermost. It will also be well to inquire, what form of bandage or fastening will least interfere with the circulation of the blood in the foot. Some of your medical correspondents will perhaps afford us the advantage of their knowledge of anatomy.

I have only further to observe, that the adaptation of a similar appendage to the hand or arm appears equally practicable, if the contrivance now described shall be found to answer.

Your's, respectfully, G. W.

IMPROVEMENT IN TUBULAR-FLUED BOILERS.



Sir,—Having lately superintended the making of a locomotive steam-engine for drawing coals along a rail-road, and conceiving the plan of a tubular-flued boiler, as adopted by Mr. Stephenson, preferable to any that I was hitherto ac-

quainted with, (but which has, at the same time, some defects,) I have followed the same mode, introducing an arrangement in fixing the pipes in the boiler, which I consider to be an improvement, and which will remedy one of the defects to which, I understand, Mr. Stephenson's boilers are subject. Should you deem a description of this arrangement worthy of a place in your highly useful and interesting Magazine, (of which and to which I have been a constant reader and subscriber from its commencement), or that it might possess any interest to any of your numerous readers, this communication is very much at your service. I understood, from reading Dr. Lardner's Lectures on the Steam-Engine, and from other sources, that very serious objections had arisen to Mr. Stephenson's method, owing to the expansion and contraction lengthwise of the flue-pipes taking place prior to that of the boiler in which they are inserted, thereby loosening their rivetting, or upsetting into the boiler ends, and causing a considerable leakage. It therefore occurred to me that, when the pipes are not particularly small and numerous, stuffing-boxes for the extremity of each might be adopted with advantage, at that end of the boiler where the chimney is situated; and that if these could be kept sufficiently tight and well packed with hemp, so as to resist the pressure, the defect arising from the unequal expansion and contraction might be remedied. This experiment I accordingly tried, though with some degree of apprehension for its success; and I am happy to say that the desired object has been attained, even beyond my most sanguine expectation, at a pressure of 50lbs. on the square inch, which is as great as is wanted. The boiler is 6 feet long by 2 feet 9 inches in diameter, and perforated by 46 copper flue-pipes of 1½ inch interior diameter. In order that the plan may be rendered intelligible, I beg to refer you to the accompanying figures, of which 1 and 2 are drawn on half the real scale, and 3 on an indefinite scale. Fig. 1 is intended to represent the method which I understand is usually adopted in inserting and fixing the pipes; *a* 1 being a section of the end adjoining the fire-place, and *a* 2 being that next to the chimney; *d* 1 and *d* 2 being a section of the boiler ends. It is evident that when the pipes expand (which they must necessarily do before the boiler, as they are the first receivers of heat from the fire,) the rivetting or upsetting at the end *a* 2 must undoubtedly be loosened, not having any collar or shoulder, as at *a* 1, to prevent it from so doing; and the joint must consequently become leaky, especially when there is any considerable pressure of steam applied. It may be asked why the shoulder is not also adopted at the end *a* 2; but a moment's consideration must show that this is impracticable, as the whole length of the pipe must be inserted or introduced through *one* of the holes, and it must therefore necessarily be of equal dimensions as the exterior of any part of the pipe itself. And even if it were practicable, I imagine that unless the pipes were partially curved, the force of the expansion would be so great as to be in danger of thrusting out or damaging the ends of the boiler.

Fig. 2 shows the plan that I have adopted; the end of the pipe *a* 1, next to the fire-place, being fixed in a similar manner to that described in fig. 1. The end *a* 2 is, however, turned perfectly true, the pipe being of such a length as to allow it to project 2½ and 3 inches beyond the boiler end. The hole through which it projects is countersunk or capped, and a square cap *c*, of about 1¼ inch in thickness, which is bored so as accurately to fit the pipe, the inner part of the hole being also deeply capped and packed with fine hemp or gasken, is screwed tightly on, by means of the bolts and nuts *b*. These caps and bolts are so placed that one bolt acts upon four caps, as indicated by fig. 3, which is intended to give some idea, by a front view, of the arrangement of the pipes and caps; *a* being the pipe ends, *c* the caps, and *b* the bolt ends and nuts. I have found this plan to be perfectly steam and water tight, and that it not only allows the expansion and contraction of the pipes to act innocently, but also, by allowing length of pipe sufficient, will afford an opportunity of cutting off the end *a* 1, of turning a new shoulder thereon, and re-rivetting it, should it become injured by the intensity of the fire—thereby saving the expense of procuring a new set of pipes whenever such injury is sustained. Hoping that I have rendered myself intelligible in endeavouring to explain my plan, and that it

may be of service, or afford an useful hint, to experimentalists in locomotion,

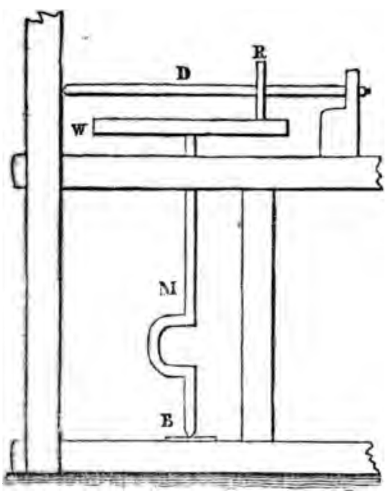
I remain, Sir, your obedient servant,

HENRY BRIGGS.

Overton, near Wakefield,
April 27, 1833.

P. S.—Should the pipes be wished to be inserted of small diameter, and many in number, so as to render a separate stuffing-box for each impracticable, I conceive that they might be collected together, at the chimney end of the boiler, as it were, in clusters of 6 or 7, and fixed into a larger *short* pipe, which might again work in a stuffing-box.

A SUPERIOR TURNING APPARATUS WITHOUT A BAND.



Sir,—The above figure shows a plan for doing away with the use of the band in turning, and for gaining, besides, advantages the band never could have procured. W is the wheel, taken out of its old position and placed horizontally immediately under the mandril; D is the mandril, elongated so as to stretch entirely across the face of the wheel; and R is a friction-roller, made adjustable at any part of the mandril, so as to compel it to revolve with *it*. *The face of the wheel is turned perfectly plane*; and the wheel itself should, along with the roller, be made of such materials as unite to hardness the quality of generating the greatest possible quantity of friction among themselves. The roller R is kept in contact more or less strict according to the kind of work to be done; and is also varied in its position, with regard to the centre of the wheel, in proportion to the velocity the work is required to have in turning. The contrivances for managing the adjustments of the roller in both these respects are too obvious to require particular specification; one caution, however, I should like to suggest:—in case the mandril should spring, from its great length, or the surface of the wheel should do so from the manner in which the pressure of the roller is applied, the double inconvenience would, I think, be completely remedied by putting on the mandril another roller free to revolve on the mandril, and as far from the centre as the friction-roller R. This will equalise and balance the pressure on the surface of the wheel, and reduce the spring of the mandril almost to nothing. But these are not the only advantages of this arrangement: there are others peculiar to it, and perhaps even more important. This position of the wheel offers facilities for giving various independent motions to the cutting tools. To give one instance: screws of every variety of thread may be cut by this arrangement. To do this, another friction-roller must be applied, whose axis of adjustment is in the direction of the radius to the wheel; let there be also a wrest, cut into a screw fixed before the work so as to revolve; its head may be connected with the axis of the roller by a Hooke's universal joint, or by bevelled tooth-wheels, and so every new adjustment of the roller will vary the velocity of the revolution of the screw-wrest, and, with it, that of the cutting tool which it may be made to carry along with it. Many such independent friction-rollers may be placed on different radii of the wheel, and so a multiplicity of various motions be generated, each separate motion itself being variable *ad infinitum*.

I am, Sir,

Your obedient servant,

Φ. Ψ.

SOLUTION OF THE TENTH MATHEMATICAL QUESTION (last vol. p. 158.)

Question.—Demonstrate the 22d and 23d propositions of the 5th book of Euclid, without the assistance of the 20th and 21st propositions.

Solution by the Hon. Lionel Smythe, the Proposer.

I. *The 22d Proposition, Book V.*

If there be any number of magnitudes, and as many others, which, taken two and two in order, have the same ratio, the first will have to the last of the first magnitudes the same ratio which the first of the others has to the last.

1st. Let there be three magnitudes, A, B, C, and other three, D, E, F, which, taken two and two in order, have the same ratio, viz. A : B :: D : E and B : C :: E : F. Then A : C :: D : F. Because A : B :: D : E; alternately A : D :: B : E. Also since B : C :: E : F; alternately B : E :: C : F; hence (11 and 5) A : D :: C : F; alternately A : C :: D : F.

The 2d part of the proposition is demonstrated from the 1st case; but it seems to me impossible to make it shorter than in Euclid.

II. *The 23d Proposition.*

If there be any number of magnitudes, and as many others, which, taken two and two in a cross order, have the same ratio, the first will have to the last of the first magnitudes the same ratio which the first of the others has to the last.

1st, Let there be three magnitudes, A, B, C, and other three, D, E, F, which, taken two and two in a cross order, have the same ratio, viz. A : B :: E : F, and B : C :: D : E; then A : C :: D : F.

Let A : B :: D : H and B : C :: H : G; therefore, *ex re quali*, A : C :: D : G; also since A : B :: E : F (11 and 5) E : F :: D : H; alternately E : D :: F : H. Again, since B : C :: H : G; also B : C :: D : E ∴ D : E :: H : G; inversely E : D :: G : H; but E : D :: F : H ∴ F : H :: G : H ∴ (9 and 5) F = G; and since it has been proved that A : C :: D : G ∴ A : C :: D : F.

The same remark that was made after the last proposition will also apply in the 2d case of the above.

It may not be out of place to observe, that the demonstration (prop. 18, book v.) which, as given by Euclid, is rather tedious, might be more briefly demonstrated without the assistance of equimultiples, as follows:—

Because A : B :: C : D; alternately A : C :: B : D ∴ (12 and 5) A : C :: A + B : C + D ∴ (11 and 5) A + B : C + D :: B : D; alternately A + B : B :: C + D : D. Therefore, &c.—Q. E. D.

LIONEL SMYTHE.

Academy, 6, Abbey-road,
St. John's Wood.

[Solutions of this question have been also received from B. R. A.—A Westminster Scholar—Parabola—and a Constant Reader (at Whitby). We have preferred that of the ingenious proposer, as being on the whole the most satisfactory, and for the sake also of the judicious suggestion at the close.—ED. M. M.]

REPORT OF MESSRS. WALKER AND BURGES, CIVIL ENGINEERS, ON THE STATE OF BLACKFRIARS BRIDGE.

Since the worthy citizens of London have been reckoning up what it has cost them to build their new bridge and take down the old one, and contrasting the immensity of the expenditure with the insignificant amount of positive good which they have derived from it, an opinion is, with good reason, gaining ground among them that they have paid excessively dear for their whistle. Two millions is, certainly, an enormous sum (in times of national distress especially!) to lavish on a mere matter of taste; for, after all the outcry that was raised against the old bridge, on account of the injury it was *said* to cause to the navigation of the river, every one is now at a loss to discover what the navigation has gained by its removal, while for every purpose of land traffic the old bridge was nearly as good as the new—being equally straight, almost as wide, quite as strong, and inferior principally in architectural elegance. The whole affair in truth was a prodigious job, and prodigiously the children of Gog and Magog have paid for it. The good citizens are even denied the consolation of thinking that they have seen the end of their folly, for to the two millions already expended many thousands, if not millions more, must yet be added, to defray the expense of various necessary changes consequent upon the change of the old bridge for the new. A sum of 90,000*l.* is now required to save Blackfriars Bridge from the total ruin with which it is threatened, chiefly through the alteration caused in the general state of the river, by the removal

of the dam at Old London Bridge. The measures taken to protect Westminster Bridge from a like catastrophe cannot have cost much less. And there is, probably, not a single proprietor on either side of the river, above the site of old London Bridge, who will not sooner or later be obliged to adopt at like heavy expense similar defensive measures for the protection of his premises. Neither can any one of the gulled multitude claim the saving benefit of a "Who would have thought it?" For there is not a single circumstance in this long train of loss and damage which was not distinctly predicted by the most eminent men of science of the age, *before* the edict passed for the destruction of the old bridge. Every thing is happening precisely as Mr. Smeaton, Mr. Telford, Dr. Gregory, and others, foretold, and as we did our best, about two years ago, to remind the public would assuredly happen, unless averted by such remedial measures as were still, at the eleventh hour, capable of being carried into effect.

On the 27th of September last (that is, not till more than a whole year *after* the opening of the new London Bridge had elapsed), the Court of Common Council appointed a Committee to take the necessary measures to ascertain the effects which the change in the river had made on the condition of Blackfriars Bridge, and how they might best be remedied. Messrs. Walker and Burges, civil engineers, were selected by this Committee to make a survey of the bridge and estimate of the necessary repairs; and on the 25th of April last, the Report of these gentlemen was laid before the Common Council. We have now a copy of this Report before us, and as it contains matter of great interest to the public at large, as well as to the engineer profession, we shall transfer it, with but little abridgment, to our pages.

REPORT.

* * * * * *

Our first object was the survey of the bridge, and for that purpose we naturally expected to be furnished with some plans, or other information, as to its construction. In this we have been disappointed. Although the bridge was built under the direction of the City of London, there do not appear to be any plans or documents in the possession of the Corporation that give the smallest assistance in any of the objects of our inquiry.

* * * * * *

As the common diving bell appeared to us from its size to be inconvenient for examining the foundations, without a large excavation near the piers, which it was desirable to avoid, and from its not affording the opportunity of examining the vertical face of the stone work, we applied to Mr. Barnard, the member of Parliament for Greenwich, who has an interest in Deane's patent diving helmet, for the use of that machine. Mr. Deane brought it from Portsmouth, and has attended us during the survey, having, as well as ourselves, frequently descended to the foundations and examined the work by means of it.

Timber and Stone of Foundations.—The first particular object of our survey was the condition of the timber and stone work of the foundations of the piers. For this purpose excavations were made by dredging down quite to and under the level the caisson bottoms; and the condition as of well as the levels of the timbers, of which we took several specimens, were ascertained beyond doubt by the diving helmet. In cases where digging and examination by the diving helmet were thought unnecessary, boring was resorted to, and we are enabled to say that the timber which forms the foundation of the piers is in a sound and perfect state. The specimens when first cut appeared as bright and fresh coloured as new timber.

Every part of the bridge, so far as we have ascertained, is built of Portland stone, which is of a soft calcareous nature, and subject to decay from exposure to the weather; but we can, from our surveys, state with some confidence that all the stone work, from the foundation up to low-water mark, is as good as the day it was laid, the mortar entire in the joints, and the tool-marks remaining on the faces of the stones.

Levels of Piers.—Our report of the levels of piers, both as respects the different points of the same pier, and comparing them with each other, is also favourable. We have attached to this Report a list of the comparative levels, to which we beg to refer: it will be seen that the greatest inequality in the level of any one pier does not exceed $4\frac{1}{2}$ inches, and that the greatest variation in any wo points of different piers is not more than 6 inches. Supposing even that all the points referred to were originally quite level, which with caissons it is very difficult to accomplish, the work has settled very little, and there would be nothing to apprehend on this score if the state of the river had continued the same as when the bridge was built, or as it was previously to the re-

moval of London Bridge, or probably, with little exception, even in its present state.

General State of Bridge.—As respects, therefore, the state of the bridge itself, it may be safely affirmed that up to low-water mark it is perfect, and that the imperfections of the stone work begin from that level. The repairs which are required above it are fully described in the accompanying specification, to which we beg to refer; and shall here only state the principal features, and our reasons for recommending works to the extent we have specified.

Piers and Abutments.—From the level of low water before the removal of London Bridge to nearly the high-water mark, the whole of the stone work forming the front of the piers and abutments is in so very dilapidated a condition as to make new facing with better stone the only prudent and safe plan of repair. The ends or cut-waters of the piers, being more exposed to blows from barges and ice, are still more damaged, and so shaken as to render a renewal from the footings absolutely necessary.

Levels of Tides and Facing required.—Previously to the removal of London Bridge, the low-water mark was seldom under the top of the offset courses of the piers, and in the great proportion of tides still higher, so as to protect the first course above the footings, which is in a much better condition than those above it. The result of the removal of the old bridge has already been to reduce the level of low water about 22 inches at Blackfriars Bridge, and as this effect will increase as the remainder of the piers of London Bridge are cleared away, we have no hesitation in recommending that the new facing should commence from the offsets,* and be carried one course or about 2 feet 3 inches on the average above the high water of ordinary spring tides. *Extreme* tides are 3 feet above the level of ordinary spring tides, but as such tides occur seldom, their action on the stone is not to be feared. We consider that the effect on the high water above London Bridge, by the removal of the old structure, is already produced to nearly its full extent, which we never considered would be more than raising the level above one foot, as stated in Messrs. Walker and Leach's Report to the Navigation Committee in 1821, being the amount to which the old bridge acted as an obstruction to the free flow of the tide, or the difference between the level of high water on the two sides of the bridge. The level proposed for terminating the new facing we therefore think ample: the whole height of new work will be 18 feet and 3 inches, which will extend round all the piers, and in addition to this, the quoins of the arches will be renewed 5 feet higher. We propose the cut-waters and shoulders of the piers, and the quoins or facing archstones, to be of granite, the other parts to be of Bramley-fall or some other equally durable stone.

Columns.—From the very dilapidated state of the cut-waters of the piers, the columns which rest upon them are endangered, particularly towards their bases, by which the high tides have reached and decayed the stone: some of them have besides been struck by barges which have displaced the lower stones of the shafts, so that these columns are really dangerous. A heavy blow on the disturbed stones might be the means of throwing down the column altogether, and the recess over it would follow; the consequences of this might be very serious, both with reference to the lives of the persons in the barge, and of those in the recess at the time, who would probably be precipitated with the falling column into the river.

(To be concluded in our next.)

* This is supposing the repairs to be done without the coffre-dams hereafter referred to.

MR. SYMINGTON AND STEAM LOCOMOTION.

Sir,—Among the many painful emotions excited by the recollection of the late Mr. Symington's wrongs, some of an opposite character present themselves—the instances of kind friendship and generous sympathy which he experienced. Allow me to express the deep sense of gratitude entertained by the family and relatives of that lamented individual, for the liberal and disinterested manner in which you, a stranger, have also come forward and so warmly and ably advocated his cause—a cause the justice of which additional proofs are daily establishing.

I observe in a note appended to the article contained in your last Number, a wish expressed that a little more information should be furnished on the subject of Mr. Symington's first steam-engine improvements. The information will be supplied as speedily as possible. Meantime it may not be improper to mention, that the nature of the narrative, and the purpose for which it is intended, rendered the propriety questionable of making it more voluminous by going at greater length into detail.

Permit me, Sir, to set you right on one or two points concerning Taylor's pretensions. Instead of "full two years elapsing" before Mr. Symington was introduced to Mr. Miller, after exhibiting his model in Edinburgh, it was *during its exhibition*, shortly after its arrival there, that Mr. Miller called and inspected it in the house of the late Gilbert Meason, Esq., when the conversation took place recorded in your publication, and in my narrative lately published. Of course this totally precludes the possibility of Taylor, even by his own account (and it is surely unnecessary to grant such a character more than he has demanded), having suggested the application of the steam engine for the purposes of navigation; for he has distinctly stated that the idea had never occurred to him until after a certain boat race at Leith, in the spring of 1787, and till after he, in company with Mr. Miller, "had beat over the whole system of mechanics."

I reserve any further observations on this subject until another opportunity, fearlessly leaving it to those acquainted with mechanics, whether such a pretender ought to have met with any other return from Government than the rejection of his application for reward. How Government afterwards allowed itself to be imposed upon and grant a pension for his services is yet a mystery.

With respect to Mr. Miller's liberality it was any thing but extraordinary; and if he swore, as Taylor says he did, that Mr. Symington was "a vain extravagant fool, and did not care how much of his money he wasted," he certainly must have been a person of distempered imagination. For although Mr. Symington, in addition to the time, trouble, and anxiety he had bestowed on the undertaking, had also been put to considerable pecuniary expense, he never received the slightest remuneration, but was, on the contrary, doomed to experience the mortification (after having fully proved the correctness of his opinions) of seeing his just expectations frustrated through the whim and caprice of a speculative *amateur*. But what, after all, was the amount of the large sum which put Mr. Miller so much out of temper? Why, only 363*l*. 10*s*. 10*d*.!!! as attested on oath by the late Mr. Joseph Stainton, manager of the Carron works.

Mr. Miller's inconsistency of conduct on this occasion often excited surprise, and Taylor's biographers have endeavoured to account for it in a way which must be any thing but pleasing to Mr. Miller's descendants, who might have felt justly offended, had they not joined with Taylor in endeavouring to calumniate Mr. Symington. Verily they have got their reward, and are doubtless enjoying it.

Mr. Symington would never allow himself to believe Mr. Miller capable of being influenced by the motives imputed to him by Taylor's friends, or of sanctioning the unjustifiable assertions of his own sons. And the only conjecture he could offer, as an excuse for actions the motives of which he could not comprehend was, that Mr. Miller was of too volatile, speculative, and impatient a disposition to allow him to persevere sufficiently in any undertaking to bring it to perfection.

Before concluding I beg leave to inform you, that Mr. W. Symington was aware that the Leghorn vessel was of more ancient origin than 1671, as in Witsen's work, in the library of the London Institution, it is stated to have been taken from the book of Robert Valturius.

With much respect, and best thanks for your very friendly and polite attention,

I remain, Sir,

Your most obedient servant,

ROBERT BOWIE.

94, Bishopsgate-street Within,
May 30, 1833.

Paper Sold by the Mile.—Paper used to be sold by the sheet, the quire, or the ream; but in the march of improvement stationery will not remain stationary, and so it is now sold by measure. The world was thrown into astonishment by a recent announcement that at a mill in Derbyshire a sheet of paper a mile in length had been manufactured; what, then, will be thought of sheets extending to the length of four or six miles? Nevertheless, such are actually made by Messrs. Foudrinier, of Newcastle. The following order was the other day received by them from a pottery firm; the writer, it will be observed, gives his directions with as much coolness and indifference as if they were not at all extraordinary:—

"29th April, 1833.

"Gentlemen,—Please to send us 10 miles of your best printing tissue paper in length—six miles to be 30 inches broad, and four miles 22 inches broad; to be wrapped on wooden rollers, according to the plan given by Mr. George Foudrinier.—Yours, &c."

We understand the object in having the paper of such great length is, that it may be printed from engraved cylinders in the same way as calicoes, &c.—*Staffordshire Mercury*.

Compression of Turf for Fuel.—It appears, from a paper read at a late meeting of the Dublin Society by Sir E. Lees, that a method of compressing turf has lately been adopted in Ireland, which promises to be attended with the most important national results to that country. By means of a machine (no doubt a hydraulic-press), which is said to be extremely simple, and not to exceed £7 in cost, the water in the turf is expelled, and the fibrous materials so compressed as to approximate in consistency to coal. The turf, as cut from the bog, is placed in this machine, and one man by means of a lever can impart to it a pressure equal to seven tons. In about three seconds the sod is reduced to one-third of its original size. Exposure to the air and sun dries it in three days, when the turf brick weighs nearly 4lbs., becomes perfectly hard, and is said to emit a more intense heat than coal. Common peat has been used in England in smelting; and, in a compressed form, would be still better adapted for such purposes.

Neglect of Science in the Universities.—The universities (of Oxford and Cambridge) were originally ecclesiastical corporations, instituted for the education of churchmen, and they retain that character to the present day. The improvements which in modern times have been made in every branch of philosophy were not developed in either of these universities; they have not even adopted many of the improvements which men of science and learning have made; and they remain the sanctuaries of exploded systems and obsolete prejudices after they have been hunted out of every other corner of the world. * * * The systems of education pursued in the schools and universities, the disproportionate rewards of naval, military, and political achievements, to those of science, elevating the former with the highest honours and most enormous pensions, have a manifest effect in depressing the latter. The pernicious effects of this indifference to science upon the most important interests of society, especially legislation and the administration of justice, are most melancholy. In Parliament how is the question of science treated? In our own courts of law and criminal investigation it is lamentable to observe the frequent defeat of justice, arising from the erroneous conception or from the utter absence of the requisite knowledge. In the ordinary affairs of life we see conspicuous among the dupes of quackery and imposture those whose stations should imply the best instruction, and whose conduct, unfortunately, has the effect of example. But a change is at hand. A far-spreading contempt, proceeding from the well-springs of truth, is rapidly rising against this exalted ignorance; the industrious classes are daily becoming more imbued with knowledge on scientific subjects; and the aristocracy, if they would preserve their superiority in social consideration, must descend to the popular improvement.—*From an Address, by Dr. David Corbet, to the Worcester Literary and Scientific Institution—one of the best-conducted and most flourishing of the modern popular Institutions for the cultivation of the arts and sciences.*

Dry Rot.—A Mr. Body, of Devonport, claims to have discovered a method of protecting wood against the dry rot, equally efficacious with that of Mr. Kyan, and a great deal more expeditious. He proposes to render timber fit for immediate use in one week. His antidote is stated to "consist of a chemical powerful innoxious menstruum," wherewith he "extracts the viscid sap juices out of the heart of the timber without the least injury being done to the outside of the wood, thereby producing its indestructibility." Half a beam of oak timber, thus prepared by Mr. Body, was placed in the orlop-deck of H.M.S. the Windsor Castle in 1825, and, on the return two years ago of this vessel from active service in the Mediterranean, was found perfectly free from rottenness.

Furniture Polishing.—In large towns, such as London and Edinburgh, where the art of polishing furniture forms a distinct occupation, what is called the French polish is by far the best for bringing out the beauties of the wood, and giving it a brightness and richness of colour which nothing else hitherto invented can produce. An important advantage of the French polish is, that it is not liable to crack or shew scratches, like varnish. Wherever, therefore, the French mode of polishing is practised we would recommend its adoption, at least for all drawing-room furniture, and for the finer articles of libraries and dressing-rooms. For dining-tables Mr. Dalziel (the eminent upholsterer) states, that by far the best polish for the tops is cold-drawn linseed oil alone, rubbing them with any soft cloth for several hours, till they are got to a bright polish, which when once obtained can be kept up with little labour, and will stand hot dishes and boiling water better than the French or any other polish. The ordinary polish used by cabinet-makers consists of bees' wax mixed with spirits of turpentine and a small proportion of resin. When this has been all dissolved together, the wood to be polished is thinly washed over with it, and it is immediately afterwards rubbed off by clean soft cloths, For polishing carved work, a clean soft brush must be used for laying it very thinly on, and another brush in a very slight degree harder must be employed for rubbing it off. — *Loudon's Cottage, Farm, and Villa Architecture.*

Jets of Water.—The perpendicular height to which water will rise in a jet has a limit, depending on the diameter of the jet and on the specific gravity of the water, and on that of the air which it has to penetrate. A jet of salt water will rise higher than one of fresh water—a column six inches in diameter higher than one of three inches—and a jet of water, of any dimensions, higher at Madrid or Munich than at Paris or London, on account of the difference of the elevation of these cities above the level of the sea, and the consequent difference in the density of their atmosphere. The most powerful garden jet in Europe is that in the Nymphenburg gardens, near Munich. The water is there forced up the jet by the direct influence of machinery, without the intersection of a head or reservoir; and it is found that a column of six inches in diameter cannot even there be raised higher than ninety feet.—*Ibid.*

INTERIM NOTICES.

We are not sorry to learn that, in the heading of the letter of Mr. Mathews, inserted in our last Number, we made an error in describing as "the *late* Mr. Murdoch" the gentleman whose name is so honourably connected with the history both of gas-lighting and steam-travelling. We are informed that he still survives, though advanced in years and not exempt from the infirmities common to the greenest old age. May he yet see many happy days!

Mr. Cheverton "On the Undulating Railway, and on Modern Modes of Philosophising," in our next. Will he have the goodness, in the mean time, to send to our office for a letter addressed to him?

Communications received from Mr. T. V. Robson—S. D.—G. S.—Mr. Bennett—Mr. White.

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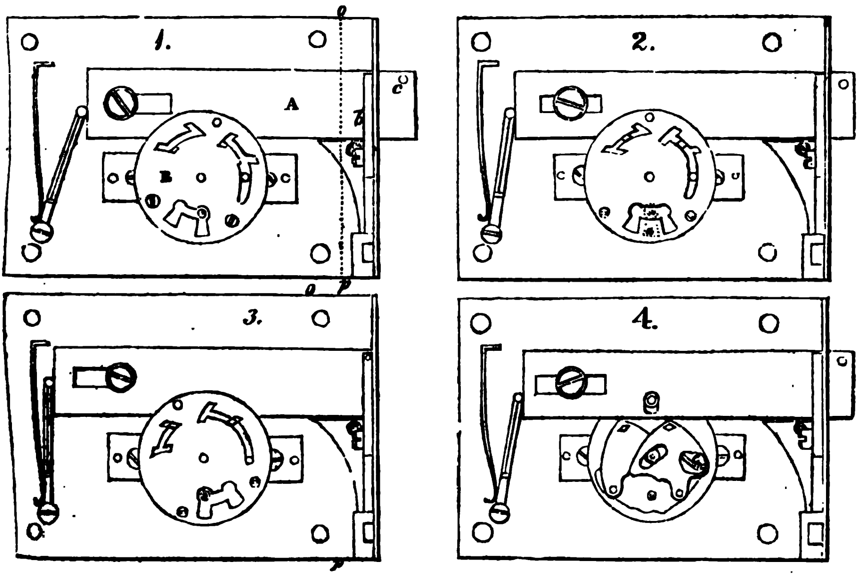
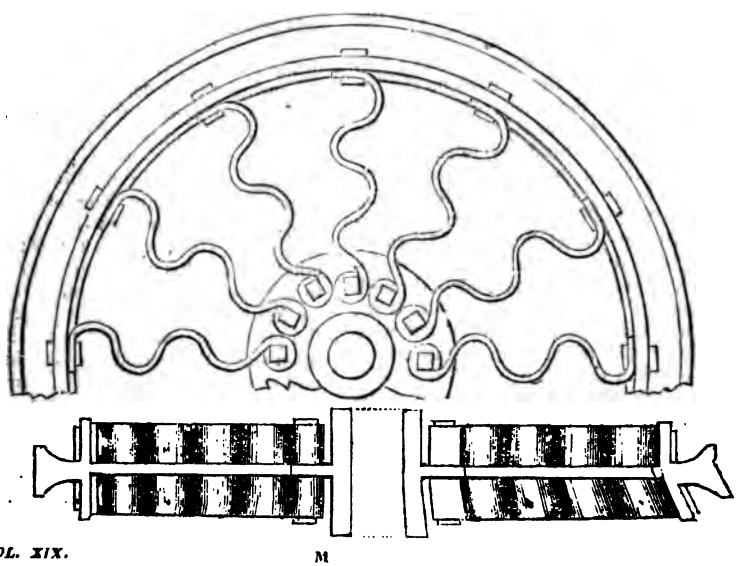
LAWTON'S SAFETY SPRING LATCH.



SPRING WHEEL.

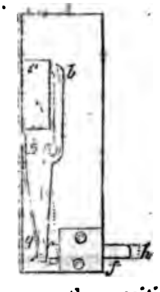


LAWTON'S SAFETY SPRING LATCH.

When describing Mr. Lawton's patent lock (Mech. Mag. March 31, 1833), we mentioned that he had constructed a spring latch for street-doors on the same principle. We shall now, agreeably to our promise, add to our extracts from Mr. Lawton's pamphlet his account of this latch, which will be found to possess this peculiar advantage, that while it possesses all the convenience of the common spring latch, it cannot be put back while in a locked state, as is the case with all other spring locks.

Fig. 1 represents a spring latch for a street-door, which may be opened on the inside by a knob or handle in the usual manner. In this figure the bolt A is shown in the position it assumes when the door is fast; but when the key is applied to draw back the bolt A, the curtain B passes before the key-hole and assumes the position shown in fig. 2, the place of the key being shown in dotted lines at *a*. The key being made to continue its effort upon the moving parts, the bolt A is drawn back until a small stud, formed under the end of the lever *b*, fig. 1, drops into the hole *c* at the end of the bolt A, and there holds it stationary during the time the door is open; this will be seen by referring to fig. 3. In order to render the actions of these parts more easily understood, the upper plate that contains the key-hole is removed. Fig. 4 represents the same latch with the curtain removed, by which means the key-piece *e* is shown more plainly; this is fixed to the handle or knob on the inside, and therefore whenever the handle is turned it acts precisely the same as the key in lifting the tumblers, releasing and drawing the bolt A; and, consequently, all the facility of the common spring latch, united to the perfect security contained in the principle of Mr. Lawton's lock, is here obtained. Fig. 5 represents a section of the latch, taken through the line OP in fig. 3; *b* shows the lever, which in this figure is represented with its pin or stud released from the hole *c* in the end of the bolt A, which is effected by the pressing piece *f* acting upon the end of the lever *b*, and causing the spring *g* to yield. But as soon as the bolt *a* is drawn back, either by the key or handle, then the pin on the end of the *lever b drops into the hole c* of the bolt

Fig. 5.



A, and assumes the position shown in dotted lines. It may be necessary to observe, that the end *h* of the pressing piece *f* comes in contact with a striking plate of metal let into the recess which the door shuts into, and when the same is once adjusted, it will not be liable to be out of order.

SPRING WHEEL.

Sir,—The thought occurred to me in the year 1825 or 1826, that springs might be advantageously applied to carriage-wheels. I made inquiry of a patent agent as to the eligibility of the invention, and ascertained that a patent had been taken out about three years before that time for the same purpose by a Mr. Seaton.* I was also informed that it had been applied to a four-wheeled waggon made entirely of wrought iron; but that the invention was laid aside because the wheels were not sufficiently strong to bear a great lateral pressure. I examined the specification of the patent at the time, and found that the spring was the common carriage elliptic, app'ied from the nave to the periphery of the wheel; so that the weight and consequently the vibrations of the carriage would be in the direction of the length of the elliptic. The form of spring proposed by Junius Redivivus would possess more elasticity than this; but the other parts of his wheel are heavy, owing to the double casing of iron in which the springs are inserted. As it is likely that the preceding patent has not been acted upon since the period above alluded to, and as the subject has lately engaged the attention of some of your readers, I beg to be allowed to propose for their consideration the construction which originally

* For a description of Mr. Seaton's invention, called a fan-wheel, see Mechanics' Magazine, vol. vii. p. 65.

red to me, with some modifications
ı afterthought and observation have
ested.

e wheel represented in the accom-
ing sketch (see front page) is three
ı diameter. I propose that the nave
elloe of the wheel should be of cast
if, however, this should not be
; enough to carry the springs, a
ght iron tire might be added over
uter ring of cast iron, and rivetted
the springs to be of steel, about one
er of an inch thick, and two inches
on each side of the middle plate
cting from the nave. The general
ruction and even the details are, I
sufficiently clear from the figure
ut further explanation.

am, Sir, your obedient servant,

S. D.

3.

HE UNDULATING RAILWAY, AND ON
DERN MODES OF PHILOSOPHISING.

—I have deferred the few observa-
which Junius Redivivus's letter, in
to mine relative to the undulating
ay, seemed to require, until I had
the abstract of Mr. Badnall's pam-
that you promised to give us, and
ı having perused, I am enabled to
my remarks on both, in one com-
cation.

nius Redivivus seems indisposed to
e the praise of being "a clever
r," and is anxious to disclaim any
tation of "being a writer in the
ry meaning of the term." How-
that may be, he may be assured
his writings will always command
tion. He is the skilful *advocate*
ie opinions which I never had a
t that he does honestly espouse;
I must still be allowed to say,
he is not, like the *lawyer* in his
, accustomed to ponder well on his
ct in all its bearings. His present
brings undeniable and confirming
that he is not the practised thinker
ı his indisputable talents in other
cts would seem to indicate. He
he is but a shadow: really it is a
hat he should have taken for his
nito a name of such ill omen as
of a man who appears to have
en himself into notice only for the
se of being bought *up*.

Junius Redivivus says that I am rather "superficial" in expecting him to reason without data, and that he could not set forth a fallacy which had not been presented to him for examination. Now the very thing which called forth my animadversions, was the fact of his *having* reasoned without data, and merely upon his own fancy of the perpetual-motion nature of Mr. Badnall's scheme of an undulating railway. Indeed he acknowledges to having "*assumed* that the object of the railway was to increase power or diminish friction," and that "it was upon this assumption he reasoned." As to the latter part of the assumption, however, his whole paper does not contain a single particle of reasoning concerning it. Your readers would have thanked him for correcting Mr. Badnall's erroneous views on this point. With regard to my own notable scheme of a pendulum locomotion, he says he shall not reason upon it as a mathematical proposition, but as a practical matter. This is not exactly fair, because I did not advance it as a practical matter, but merely in a theoretical point of view. I am sorry he should have wasted his time upon what was admitted to be a practical absurdity, and still more sorry that he should have been occupied in reasoning incorrectly upon it. Will he take my word for it—for I really cannot bestow a moment's more attention upon it—that the friction upon the single axle, though of quadruple strength, would be less, in any proportion that may be thought expedient, than the four axles which it would supersede. Easy and simple as the subject is, he could not have considered or comprehended the rule that I laid down on this point. Neither does he seem to be conversant with scientific discussion, or he would not have said that a conditional proposition of mine, relative to friction, was "nothing more than a proposition that all friction shall be voted a bore." He has yet to learn, that in order to obtain a clear perception of a subject, it is often necessary to divide a cause in idea into parts corresponding to its different effects, to consider each separately to ascertain their relative values, and thus determine their order and mode of influence upon the final result; but Junius Redivivus, I fear, has not

had much practice in this way of thinking. He is equally unsuccessful as to the other details on which he has been so unwary as to enter. He speaks of the accumulation of friction which will take place upon one half of the ascent, and of its increasing as the ascent increases, when, in fact, it diminishes with the ascent, both in respect to the centrifugal force and the degree of inclination. The greatest pressure on the rail takes place at the centre of the undulation. He is, however, more discreet in regard to the two questions which Mr. Badnall put to him, and has the tact not to enter on such "*abstruse calculations*," as he terms them; for which he is to be commended, it being as much the part of a skilful advocate to know what to omit, as what to grapple with.

I have now to apologise to Junius Redivivus for not having endeavoured to understand the tendency of his air-gun letter, notwithstanding the obscurity of his mode of writing; but I must still be allowed to doubt whether "the steam and intense fire which does destroy the gun," (the generator, I suppose, he means,) is an evil which will for a moment bear comparison with the second-hand roundabout scheme of having a steam-engine, an air-pump, an air-reservoir, and other such pleasant-like adjuncts. Even as the thing stands at present, an apparatus of seven and thirteen tons weight forms rather an unique piece of flying artillery.

I hope Junius Redivivus will now, in his turn, endeavour to understand the tendency of the illustration which I gave him, of his unscientific mode of adjusting carriage springs to their load, notwithstanding the *brevity* of my mode of writing; and that it was intended to shew him the awkwardness of rectifying one evil by means of another, even though it should be the least of the two. The Spanish muleteer errs only at the outset, in his "philosophy of mule loading," by arranging the living cargo in the same manner as he would the inanimate load, but which, not admitting of a similar mode of adjusting the balance, obliges him to adopt the clumsy expedient referred to. These philosophers among the muleteers are not, however, to be met with every where, common *sense generally teaching* them that it is better, having a choice, to *avoid* an evil rather than to correct it by stumbling on another. Junius Redivivus should aim at adjusting the spring to the load, and not the load to the spring, not forgetting also the principle of self-regulation.

Modes of Philosophising.—Junius Redivivus appears to me to belong to that class of minds, which, though not competent to analyse a subject, and disentangle the complications which are the result of collateral agencies, have yet the intuitive good sense to acknowledge the fundamental and most general truths which are traced by others; but who, when they come to reason upon and make application of those truths, disregard the operation of those co-ordinate or subordinate laws which more immediately govern the result, and which produce all the modified conclusions, the anomalies, and the exceptions. They can reason consecutively enough upon the rule or maxim which they adopt, in its direct and leading train of consequences, but they have not the grasp of mind to take, in one comprehensive view, the cross-actings and re-actings which arise from the collision of opposing and modifying, though contributory causes, from the operation of which few effects or events are exempt. Their synthesis is defective, because they are unacquainted with the previous analysis, and the details of its complexities; and because they have not the talent, amidst a confusing multiplicity of particulars, to apportion, proportion, balance, weigh, and estimate. They are men of single views, of limited vision, and are bewildered with the varied phases and conflicting aspects which things present in their actualities; they can neither resolve them into their original elements, nor recompose them even when the primary truths are presented for their use. They therefore resort to mere simple or speculative truth, apart from any correcting influence, and from thence they bring forth abstractions and creations, which neither conform to things as they are, or as they should be. They mistake the nature of general propositions, for they consider them as constituting a *clue*, which, if they implicitly and blindly follow, will guide them through the labyrinth to the temple of truth; when, in fact, they are to be regarded rather as

indexes or finger-posts, which point out only generally the direction in which it lies, and leave much to judgment and discretion. In short, they make things bend to the rule, and not the rule to the emergency of things.

Yet these are they who plume themselves not a little on their enlarged and comprehensive views, merely because they happen to take up and descant a little on enlarged and comprehensive truths, and without knowing the true mode of applying them. Why, the mere practical man, whose notions are limited to immediate antecedents and consequents, and bounded by circumstantials, who appreciates not the pervading influence of general causes, and makes particular cases of every thing which comes under his notice; a man, I say, of this stamp and mould, but who has the faculty of keeping a large field of observations in view at one time, and of seizing upon and discriminating in regard to their mutual relations and their respective bearings upon the subject in hand, and who exercises a sound judgment, though it may be upon only a good common-sense review of the whole; such a man possesses a mind of a higher order, of a greater range, and of larger powers of comprehension, however much it may be the general feeling of the present day to undervalue him. The practical conclusions at which he arrives may be called empirical, but they will generally be found accordant with truth —truth not in the abstract, as with the mere theorist, but in the concrete, or as exemplified in the actuality of things; and if true, they will also be found to correspond with those which the complete and perfect theorist establishes when he works them out from first principles.

Minds of that class on which I have animadverted are not, however, without their use: they serve to draw the general mind away from those too particular deliberations to which it is prone, and to accustom it to general reasonings, and to the contemplation of those universal principles which prevail on the whole, or which will or ought to prevail in the long run. They hurry into extremes which are palpable, and therefore easily corrected by the exercise of good common sense, and thus there is produced a medium, and a more just way of thinking —the *juste milieu* prevails. Besides, though of a congenial speculative turn, they are not all of the same school; they take up opposite principles, and being by the very constitution of their minds zealous partisans, they bring about by their mutual contentions that very correction and modification of opinions which they neglect to make for themselves.

I have thrown out these remarks— which, by-the-bye, are mere hints or embryos of thought, and which can be better appreciated by those who have pondered on such topics, than by the general reader—not because they naturally arose out of the subject, but because the subject, or the occasion of my addressing Junius Redivivus, arose from considering him to belong to that class of incomplete and unpractised thinkers which I have endeavoured to describe, and from a wish to point out to him that path which it were a pity a writer so able and so well-intentioned should not pursue. This inference, however, has not arisen solely from the subject he has ventured to discuss, but from the general tone and tenour of all his communications, and I have little doubt that his next paper on the population question will bring confirmation of its truth; for it should be observed, that this false reasoning is not at the present day so characteristic of physical, as of moral and economical science. Junius Redivivus has considerable talent for observation. He has travelled to good purpose: he has favoured your readers with the best account of the American rifle which has been given to the public: indeed he cannot take up his pen on any subject scarcely, and not be a welcome contributor to your pages; and if he should think proper to make any remarks upon the foregoing observations I shall be happy to see them. But, as to myself, I must decline entering further on the subject, not that I have any disinclination to discuss it, even at much greater length than your pages, or its practical character, would permit, but my avocations will not allow me sufficient leisure to do it justice. To the same cause must be attributed the delay in sending this communication.

Mr. Badnall's Theory.—Mr. Badnall has replied to Junius Redivivus, on the

subject of his undulating railway, in so candid and ingenuous a manner, and without manifesting the slightest inclination intentionally to palm a fallacy on the public, that the mistakes into which he has been led, either by his experiments, or by an originally incorrect view of the nature of motion, deserves to be noticed in the gentlest terms.

I shall, however, confine myself to directing Mr. Badnall's attention to what I consider the primary error, and to which I alluded in my former letter to Junius Redivivus. He appears to think that the locomotive force which urges a carriage along a level plane, is not of a similar kind to that of gravity, which carries it down an inclined plane. He speaks of the latter truly, as being a uniformly accelerating force, but does not admit of the motive force of the engine being of an accelerating kind, though he must be aware that it is a constant force. Whether it is, like gravity, uniformly accelerating, is not necessary to the inquiry, depending altogether upon practical arrangement. Mr. Badnall, however, reasons and makes his calculations (p. 95) under the idea that the locomotive power, apart from that portion of it employed to overcome friction and the resistance of the air, produces only the force of impulse; hence he assumes, in his supposed case, a locomotive force sufficient to overcome these obstacles, "*and* to move a carriage along EA at a maximum velocity of 10 yards per second," and then calculates, easily enough, that $17\frac{1}{2}$ seconds will elapse in moving from E to A. Now this is exactly the case of a carriage, which is *started* with the impulsive force of 10 yards per second, but which carries with it no more power than just equivalent to cope with the afore-mentioned locomotive obstacles, and the velocity of which will be always the same as at the first instant of its projection. But if there be a surplus of locomotive force (and this is the particular which Mr. Badnall forgets,) over and above what is demanded for locomotive resistance, then an accelerated, and not a maximum velocity, of 10 yards per second will take place; and if this excess of force be a uniformly accelerating one, and if its intensity, in respect to the mass to be moved, be the same as that of gravity, then, as the two forces though dissimilar in their origin are similar in kind, having the same laws of action, the effects will be the same; and the rate of velocity acquired over the same space, and the time in attaining uniform motion, will be precisely the same, whether the carriage travels down the inclined plane or along the horizontal line. If the surplus force be not uniformly accelerating as that of gravity, or not of equal intensity, then the space which would be required, before the carriage would attain uniform motion, would be be greater on the horizontal line—that is all. The working force, or that opposed to resistance, is of course supposed to be the same in each case. Here we get at the secret of the experiments at the Adelaide-street Gallery: the railway, as to the horizontal line, was not long enough for the carriage to attain its uniform motion, whilst on the undulating railway the inertia was overcome almost immediately. Mr. Badnall should of course compare only the ultimate velocities. Does he intend to redeem his promise of sending the carriage again to the gallery? If so, I should be desirous, with his permission, to make an experiment of a very easy kind, which has not yet been proposed, and which would, if I mistake not, prove that the undulating line would in practice be even much inferior to the horizontal one.

Your obedient servant,
BENJAMIN CHEVERTON.

P. S. I beg to assure Junius Redivivus that he has been hoaxed in regard to the caoutchouc waterproof hat; and as to the Berlin castings in iron," that a friend, who has been over the foundry, informs me that there is no secret whatever in the process, and that their excellence depends entirely on care in moulding, and on the fine quality of the sand, some of which is in my possession.

STEAM CARRIAGES.

Sir,—Permit me to occupy a little space to inform Mr. J. O. N. Rutter, (p. 104,) that I did not call my steam carriage the "Triumph," because it had overcome the difficulties he speaks of, which still exist, and I fear will do so to the exclusion of *swift* tra-

velling, with economy, on common roads, but because it had five years ago ascended on plain wheels a very steep and smooth acclivity (1 in 6), which was then thought impossible, as witness the many contrivances of ground hooks, propellers, &c. patented about that time. This ascent was effected with *small power* (because a greater could not be had), *a long leverage*, and disposing of *a large but due proportion of weight on the propelling wheels*, by which the interlocking force ('tis not friction) on the plane was made more than equal to the strain. And I would say to "Dubitans" p. 116,) that 'tis for want of this due adjustment of weight, that the rail-road carriages backslide two rounds in eighty-six. I would also observe to this gentleman, that all I propose by my main levers is to enable a carriage to work in a general way with a minimum of power and self-weight, and of course expense, and yet to have *always at hand, in the smallest compass, the means of quadrupling that power in emergencies*, such as perhaps may occur ten or fifteen times in a journey from London to Liverpool, abating speed of course. The lifting the fore carriage off the ground was not mentioned as any perfection: it was a fault, as the fore wheels previously had not "interlocking force" sufficient to pilot the carriage. I have now but small expectation of supplanting stage coaches (Mr. Hancock's present trials on the Paddington road will tell us in time something worth knowing); but I think 50,000 of the horses, working at a slow rate, employed by public carriers in England, may be beneficially removed from the roads by the use of steam. And it is my intention to issue proposals at a future day, *for the formation of a company to supply common-stage carriers with machine locomotive power on hire or otherwise.* I throw out this hint for the consideration of your readers generally,

And remain, Sir, your's,

SAXULA.

May 30, 1833.

ON THE EMPLOYMENT OF THE RISING AND FALLING OF THE TIDES AS A MOTIVE POWER.

Sir,—In the first communication of mine, which you did me the favour to insert, (Feb. 1832, p. 375,) I proposed, as likely to be profitable, a certain new mode of employing the force of the tides. My proposal was ill considered, and your correspondent, Trebor Valentine, exposed the error I had fallen into. As he explained, there might have been a sufficiency of power included in the magazine, but it was nowhere concentrated with sufficient intensity to be available. I think that objection could be removed as follows:—Instead of providing, as before, a fixed air-tight chamber, 1000 feet square, let a large float of the same dimensions be constructed, and *build the mill that is to be moved upon it.* Now, if a tube went down through the centre of this, and if a very strong iron pillar were fixed immoveably in the bottom of the water that elevates the float, and if the pillar carry a rack of teeth, it will concentrate and communicate the whole of the ascensive or descensive force of the float to the machinery upon it and in communication with the rack. As, however, no construction of such dimensions could be made so as not to bend or break when sustained by its centre, it will be necessary to multiply the sustaining points. I should propose, therefore, dividing the surface of the float into sections of 100 feet square each, and fixing a pillar in the centre of each; and such an arrangement would, I think, bring the plan within the reach of practice. It may at first sight appear strongly objectionable to have 100 points of generation of force instead of 1, as is the case with the steam-engine; but is it not, in fact, and on the contrary, a capital advantage? Does not the power generated by the steam-engine undergo a very serious discount from the necessity of distributing it, so much concentrated as it is, over a large surface of subordinate machinery. In the plan I propose the factory may, and indeed ought to be, built all of one story; each room or department will have the power it requires generated within itself, with the least possible deduction on account of friction sustained either at the prime mover or during the course of transmission; and if any extraordinary effort is to be made, it will not be difficult to concentrate the powers of the whole 100 pillars at one spot. It appears to me that a float so constructed, of 1000 feet a side, and rising 1 foot per hour, would supply available power to the amount of 60 or 70 horses' power,

although it would produce only what is required to work a 40-horse steam-engine, viz. about 70,000,000 lbs. per hour; and this because it avoids incurring either the primary friction of the steam-engine itself, or the secondary friction sustained during the distribution of power.

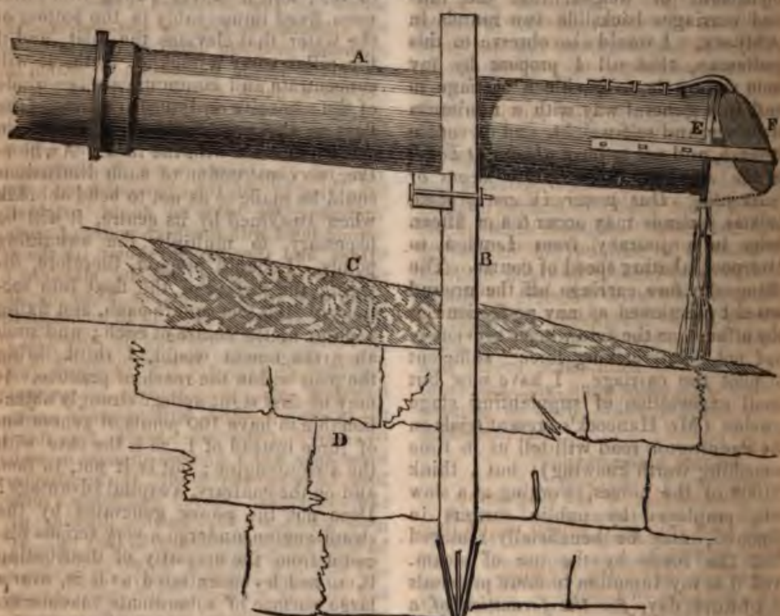
I am well aware that such a plan as this could appear practicable only when tried on a very large scale, and when the other moving powers are too expensive or too scanty to be available; such a combination of circumstances may happen, as in Holland, and in that case this construction would, I am confident, pay well, provided that the float is not under 1000 feet square.

It does not appear to me necessary to surround such a structure with a wall; the side exposed to the violence of the waves might be defended by a sea-wall: on the others it would be sufficient to erect strong stone pillars at intervals, furnished with friction-rollers to prevent any lateral movement of the float.

I am, Sir, your obedient servant,

Φ. α.

BRIGHTON DRAINAGE.



Sir,—The drainage of the district of Brunswick terrace and square, adjoining this town, is effected by four cast iron pipes, which discharge into the sea between high and low water marks; and the mouth of each pipe had originally appended to it a flap, hung by a strong hinge from the upper edge, the distance to which it could open being regulated by a short and strong chain, connecting the lower edge of the pipe and flap. The use of the flap was to prevent the *sea-winds from blowing* back the offensive effluvia of the main drains through the private drains of the houses which communicated with them; the impulse of the fluid discharge being always capable of opening the flap sufficiently to effect its own exit, without admitting the wind in any injurious degree. But in stormy weather the violence of the immense waves beating on the shore was found so very great, as to cause the repeated fracture of the chains confining the lower parts of the flaps, which often yielded to the force of a wave in its re-

flux, and the flaps, then swinging freely, soon broke loose from their hinges and were lost.

To remedy this evil I have adopted the contrivance shown in the accompanying diagram. The flap is hung as before, but without any chain, and in lieu of it there is fixed by three strong iron bars a permanent cast iron shield in an oblique direction, so as that when the flap is open as far as the shield will permit, its outer flat surface is wholly in contact with the inner face of the shield. The effect of this is complete, for when the pipe is suddenly covered with an overwhelming wave, which is often eight or nine feet high, the space between the flap and shield is, of course, filled with water, which water, as the wave returns, acts as a *hydraulic cushion*, and protects the flap from violent mechanical action, so much so that it seems doubtful whether under such circumstances alone it ever opens beyond an inch or two, and often not at all.

As your valuable miscellany is particularly intended to extend the knowledge of practical improvements, however small, I have thought the above little contrivance, which has been well tested by experience, may not be unworthy of being recorded in it.

I am, Sir,

Your very obedient servant,

C. A. Busby.

Stanhope-place, Brunswick-terrace,
Brighton, June 2, 1833.

Description of the Engraving.

A. Cast iron pipe, fifteen inches internal diameter.

B. Piles supporting the pipe.

C. Shingle, or beach.

D. Chalk rock.

E. Flap, fixed on a hinge at its upper edge to the pipe.

F. Shield, fixed obliquely in advance of the mouth of the pipe by three strong iron bars.

CAPTAIN NORTON'S RIFLE-BALL.

Among the latest presentations to the Naval and Military Museum, is an oblong iron-pointed rifle ball, by Captain Norton, late of the 34th regiment. The advantages of this projectile are:—first, increased momentum, equal to double the caliber of the rifle; secondly, the power of penetrating thoroughly oak planks, or other hard woods, which the leaden ball can only partially enter; thirdly, the accuracy of the rifle combined with the facility and rapidity of the loading of the musket. These projectiles are available for the shooting of the elephant, the rhinoceros, the hippopotamus, crocodiles, alligators, caymans, and other large animals, *feræ naturæ*.

REPORT OF MESSRS. WALKER AND BURGES, CIVIL ENGINEERS, ON THE STATE OF BLACKFRIARS BRIDGE.

(Concluded from p. 158.)

Alteration in Level of Cut-waters.—We propose that the finish of the cut-water, which forms the foundation on which the columns stand, should be raised 2 feet 8 inches, the present low level having been the cause of the decay near the bases which we have referred to; this will be the more necessary when the addition to the rise of the tides is considered. The columns, we have no doubt, originally stood level with the high water of spring tides, and they are so shown on the engraved elevations; but the standard of ordinary spring tides, as fixed by the Trinity House in 1800, is 10 inches on the average above the foot of the columns, so that, the London Bridge dam being removed, the bases are now generally covered with water at spring tides. We think that the alteration will improve the appearance of the columns; and as this is the only point of consequence in which we have interfered with the architecture of the bridge (having studiously avoided doing so), we have had one drawing prepared with the columns as they now are, and another showing the proposed alteration, and by them we are confirmed in this opinion. We recommend shortening the columns without lessening their diameters: their present height is in no case less than 10 diameters, which is greater by one diameter than the height usually assigned to the Ionic order. If there is any case in which a deviation from strict rule, so as to give the appearance of greater strength, is allowable, it is in bridge architecture; but, fortunately, we do not require to use any license on the present occasion.

Architraves and Balustrade.—The architraves over the columns are also proposed to be renewed. The balustrade or parapet requires to be noticed more particularly: it is at present in a very dilapidated condition, a great number of the

balusters being broken or otherwise injured, and the capping in a very bad state. Having paid great attention to this point, we do not see any way so effectual, and, on the whole, so economical, as having new balusters for the lower or east side of the bridge, and transferring the soundest of the present ones to make good the deficiency on the west side. New capping of good stone is proposed for both sides, and as the base on which the balusters stand must be repaired and reworked, we propose to reduce its height about 3 inches, which will take off the defective parts of the stone and make the balustrade of a better level as respects the view of the river than it now is.

Arch Stones.—The broken and defective arch stones, which have been measured one by one, are all to be taken out and replaced with new; the whole of the facing and soffits of the arches thoroughly cleaned, the joints pointed with pozzolano mortar, and generally, in addition to what has been stated, every part of the bridge is to be thoroughly repaired as is particularly described in the specification.

Lowering Causeways.—We have included also the lowering of the causeway on both sides of the river, and the ground under three of the arches on the City side, and one arch on the Surry side. The increase which will thus be given to the waterway will be an improvement, and the cost trifling, as the material is proper for ballast.

Foot Paving.—The foot paving of the east side is proposed to be of new granite; that of the west to be made good with the best of the present stone taken from both sides.

Stairs.—The steps of the watermen's stairs are all to be of new granite; a few of the steps are at present granite, which will do to be used again near the bottom.

Estimate.—The estimate of all the works contained in the specification amounts to the sum of 58,305*l.*, which includes an allowance of 15 per cent. for contingent expenses and superintendence.

Change of Bed of River.—On comparing the bed of the river, as shown by the engraved elevation, with the present levels, a great difference is observable, particularly on the City side. The low-water mark, which appears to have reached the middle of the first arch on this side, does not now go much beyond the middle of the third arch. Round the second pier there is shown a depth of 8 feet at low water: it is now dry, and there is nearly the same difference in the level of the ground round the first pier. The variation is less towards the middle of the river, and on the Surry side there is not much change; if any, the depth appears to have increased. But the most important difference, as affecting the stability of the piers, is near their *shoulders*, compared with the present depths in the line of the *middle*, particularly of the four piers on the south of the fourth arch, from the City side. There is little doubt of the ground having been left at least as high at the ends and shoulders of the piers as in the middle. Beginning at the fourth pier from the City side, or the Middlesex pier of the centre arch, the ground towards the middle of the pier is 6 feet above the tops of the bearing piles, or bottom of the caisson. Near the upper or west end of the same pier it is generally only 2 feet above the piles, and for 6 feet in width it is actually below the tops of the piles, and has washed from under the bottom to a depth of 18 inches; so that a boat-hook could be thrust 5 feet under the caisson bottom, of which this angle is therefore entirely unsupported, except by one or two bearing piles. Near the lower or east end of the same pier it is on the average only 2 feet above the piles, or level with the top of the timber platforms. The levels and differences of the Surry pier of the centre arch are similar to the one we have described. At the sixth pier from the Middlesex, or third from the Surry side, the ground is from 2 to 4 feet lower towards the ends than at the middle; the average level towards the ends being only 1 foot above the piles at the west end, and from 2 feet to 2 feet 6 inches at the lower end. At the ends of the second pier from the Surry side the ground is from 2 to 2 feet 6 inches lower than in the middle, and only 1 foot to 18 inches above the bearing piles.

Effects of Removal of London Bridge—We had no information to guide us as to the section of the ground previously to the removal of London Bridge; but there is little doubt that the additional scour thereby caused has been the principal if not the only cause of the deepening at the piers. As we consider that the bridge would not be secure if an increase of scour were to remove more of the ground from the foundations, we explained the facts and our opinion to the Chairman of the Committee, who considered that it would be desirable to have a survey and report of the probable effect which the entire removal of the dam formed by the piers of the old bridge would produce on Blackfriars Bridge, and the means we should advise to secure the foundations completely with reference to such removal. We have, therefore, bored the bed of the river near the site of the piers, in order to ascertain the level of the clay; because, if the caisson bottoms had been founded

upon the bed of London clay, the danger of undermining would have been much less. The result has proved that the caissons do not rest on the clay, but that in the piers, where clay has been found, a stratum of gravel, varying from 18 inches to 4 feet is interposed between it and the bottoms.

Shoot through London Bridge.—We have also made a series of observations on the fall, or shoot, at old London Bridge, with a view to ascertain its present extent, compared with what it was before any part of the obstruction was removed, that we might thereby form a judgment if the scour through Blackfriars Bridge is likely to be increased. The average of our observations gives a fall from Old Swan Stairs to Billingsgate of 2 feet 4 inches at the low water of spring tides. On reference to the table of tides, taken under the direction of Mr. James Mountague in 1820 and 1823, we find that a fall of a similar tide was 4 feet 4 inches. The difference, therefore, is already lessened 2 feet; but we think that the entire removal of the old bridge, and the shoals near it, will reduce the present shoot of 28 inches to 4 inches; or, in other words, that the water above bridge, already fallen 2 feet, will fall 2 feet more, and that the velocity and scour through Blackfriars Bridge will be much increased. The direct effect of this will be still more to undermine the bridge, unless effectual means be taken to prevent it; and it would in our opinion be imprudent to expend a large sum in the repair of the superstructure without properly securing the foundations so as to be prepared for the circumstances we have stated.

Securing Foundations.—The plan we would propose for this purpose is to drive a complete row of close piles, 12 inches thick and 13 feet long, with guide piles and walls round five of the piers, the heads being level with the top of the caisson bottoms, and to build up the spaces between the piles and the piers solidly with stone laid to a proper slope. In whatever way this is executed, the operation will be tedious and expensive; but when properly done, the work will be secure against almost any contingency. One of the modes that may be adopted is that used at Westminster Bridge, which is to drive the piles in the water, and afterwards cut off the heads to the proper level in the diving-bell, and to do the masonry also by the bell. We have prepared an estimate of this, and make the expense 23,966*l.*, including contingencies, &c., as before, which, with the sum already stated for the other repairs, makes a total amount of 82,271*l.* But the most effectual plan is undoubtedly by means of coffre-dams, as they will at the same time give an opportunity of examining every part of the foundation, and enable the stone-work between high and low water to be done in the dry, which is both better and cheaper than in the tide. The amount of dams and piling for the five piers, allowing a deduction for the difference of labour in the masonry, is 30,625*l.*, making with the general repairs a total of 88,930*l.*

Estimates.—The worst features of the above are probably the large amounts of the estimated repairs; but to do the works properly they are we believe unavoidable. The quantities are all from detailed measurements, and the prices from considerable experience in works and estimates of this nature. There is one exception as to the certainty of accuracy, and that is the cost of the work done in the diving-bell, to which so many contingencies are attached that it cannot, either as to time or expense, be estimated with correctness. We have in this case taken the prices of work done within coffre-dams as a basis, and added to them for the risk and difficulty of the work done by the diving-bell.

Time.—Our opinion is, that the repairs from low water upwards, which are stated in the first part of this Report, may be completed in from two years and a half to three years, and that if the coffre-dam plan be adopted, the works of the foundations and superstructure may both be done in three years; but if the diving-bell be used, the time is, we have said, very uncertain.

Necessity of immediate Measures of Security.—We have stated that no time should be lost in defending the bridge against accident; and when the present unprotected condition of part of the foundations, arising from the changes at London Bridge, is considered, there can be little doubt of the necessity for making the securing of the foundations keep pace with or rather precede the further removal of the dam formed by the remaining piers of the old bridge, and the shoal under it. On inquiry we learn that the latter work is to be completed in the course of the present year;* to place Blackfriars Bridge out of danger, two at least of the piers ought to be secured if possible during the same time.

Abstract.—Our opinion on the important points referred in this Report may therefore be summed up in the following abstract:—

* The Chairman of the London Bridge Committee informs us six months.

	£	s.	d.
The cost of the repairs above low water will amount in round numbers to..................	60,000	0	0
The piling, and otherwise securing the foundations, done in coffre-dams, to...........	30,000	0	0
Making together	90,000	0	0

But, whether as respects the security of the superstructure or the foundations, or the safety of passengers under and over the bridge, the works of repairing either ought by no means to be delayed: no prudent man would, we think, like to take on him the responsibility of the bridge in its present state for any time.

JAS. WALKER.
A. BURGES.

THE MERCANTILE SHIP-BUIDING SYSTEM OF ENGLAND, A SYSTEM OF DELIBERATE FRAUD AND MURDER.

The above title expresses briefly the purpose of a very remarkable pamphlet,* which was lately sent to us under a blank envelope, and without either printer or publisher's name attached to it. One half of it consists of a republication of a dialogue which appeared in Tait's Magazine for December last, under the title of "Sea Burking, or the Mysteries of Lloyd's;" and the other of a continuation, which includes several things the Edinburgh editor suppressed as too strong for publication. Whoever the bold author of this veiled production may be, we have no difficulty in recognising in him a friend of truth and humanity. The gentlemen of Lloyd's would find it much easier, we suspect, to prosecute than refute him. The picture he presents to us, of the motives which are at the bottom of the opposition uniformly made to every plan for imparting additional security to the ships of our mercantile marine, is literally shocking; but it is founded on facts and deductions which appear to us hardly to admit of denial. A short extract or two from the portion of the pamphlet not published in Tait, will place the whole gist of the matter before our readers:—

"Then, what plan would you take to prevent wrecks, and losses of vessels at sea?"

"Simply the plan which has never yet failed since the beginning of the world, of having effect in any trade or profession whatever,—namely, make it the interest of parties to get strong ships instead of weak ones; and of ship-builders to build strong and safe ships, instead of making their livelihood to depend on their building bad ones."

"How does their livelihood depend on their bu lding bad vessels?"

"Because, if a ship-builder builds a good vessel, he cannot sell it, even although he be willing to do so, without a profit."

"I have heard there is something supposed to be wrong in the classing of vessels, as it is called. Do you know how it is done?"

"Yes. The very best and strongest vessels which can be built, are reduced from the first to the second class, after they become twelve years old, and other vessels much sooner, and which operates as proscription against these vessels, because no merchant will ship his goods in one of them, if a first class vessel, as they are called, can be got, as he gets insurance effected much lower in a so called first, than in a second class vessel."

"Then, has not this practice the effect to induce ship-owners to get weak vessels to last only the specified number of years, that they will stand without proscription?"

"Yes, exactly."

* * * * * *

"You have mentioned the longest time that vessels last before they are proscribed. What is the shortest time?"

"Four years."

"And are vessels built to last only four years without proscription?"

"Yes."

"Then, what is a ship-owner to do with his vessel, after it becomes proscribed, since you say it will not get a cargo in competition with a first class vessel, as they are called. It will not sell, and he cannot keep it without expense and deterioration?"

"Keep it insured to the full value it cost him when new, send it on a hazardous voyage, get it lost as soon as possible, and get paid for it by the public, through the means of underwriters."

"By your reasoning it would appear that vessels are built without any regard to strength and safety?"

"And so they are."

"Then, what are vessels built for? Are they not built to carry passengers and goods?"

"No."

"Then, what are they built for?"

* *Sea Burking*, to the alarming Extent of upwards of Two Thousand Lives annually; with an Exposure of further Atrocities, exposing an organised System of Robbery and Murder. By SAMUEL SEAWORTHY.

"Like the razors of Peter Pindar's clown.—TO SELL.!"

* * * * * *

"Can you give me an instance or two, how money has been made in the way you speak of, by gambling in sea insurance on ships?"

"The thing is so common, that I shall be at a loss to select one; but the *** *****, which cost 4,000*l*., was insured for 6,000*l*. to cover outfit, provisions, and all expenses to sea, and sent on a hazardous voyage in 1813,—hazardous, from exposure to capture, being without convoy, when we were at war with both France and America, and it was going in the very track of American privateers and cruisers,—and hazardous, from exposure to shipwreck, as it was going to load cargoes in dangerous and exposed roadsteads and harbours; and the freight was insured for 6,000*l*., making in all 12,000*l*. insured on ship and freight."

"Well; but did not underwriters charge a high premium for these risks?"

"Yes. They certainly charged a high premium, but with a condition to return a half to the insured, if the ship performed the voyage in safety."

"And what does all this lead to?"

"Nothing, but to shew that the owners would have been gainers if the ship had been either captured, wrecked, foundered, or burnt; for in either of these cases they would have pocketed 6,000*l*. net gain, having, in that case, saved the disbursements of the voyage; for the sum paid for insurance was included, and covered in the 2,000*l*. under the head of outfit, &c.; and the very worst possible chance which could happen for the owners, was the one which did happen,—namely, the ship returned in safety."

"Then the owners would merely make a profit by the surplus of the freight above the expenses, and keeping up the value of the stock, which you say is a fair profit of trade."

"Yes; but they got a very high freight for taking desperate risks, and they were great losers—by the *ship not going to the bottom*."

"And what became of the ship?"

"It sprung a leak on the passage home, and as it was old and rotten, it was not worth the expense of repairs, and it would not sell."

"Then it was actually worth nothing?"

"Not a cowrie."

"And what became of it at last?"

"It was sent out for a cargo of timber, kept well insured, was wrecked on the passage home, and drowned every living creature on board."

"And were the owners aware that the vessel was in such a rotten state as not to be safe when they sent it out?"

"Perfectly aware of it, as they would not allow it to be examined; and I have not the least doubt that they sent it out purposely to be wrecked or lost; and, when it was wrecked, 'soon they took the onion from their eye,' and touched eight thousand pounds,—every sixpence of which came out of the pockets of the public, besides the value of the cargo."

"Did the public have to pay for the cargo too, as well as the ship?"

"Undoubtedly. It raised the price of wood by one cargo less at market; and, if it had been one hundred, or one thousand cargoes, it would just have preserved the same ratio."

"But would the public not have lost the amount, whether the vessel and cargo were insured or not?"

"No. Because, if it had not been insured, the owners would have had no inducement to send it out to be wrecked, and a strong ship would have been sent for the cargo, which would not have been wrecked, and would have saved both the value of the ship and cargo to the public, besides the lives. Insurance thus obviously produces shipwrecks."

"Well. Give me another case in time of peace, and let it be an above-board one."

"A new vessel belonging to a company cost 3000*l*., and was insured for that sum; then for 2000*l*.; and again for 1700*l*., at which time it got ashore, and got off again, and was repaired. The company not having use for it, sold it at the market price, being under 1300*l*. All this took place within less than three years, and the vessel was, with the exception of these three years added to its age, and the ordinary wear and tear, as good when it was sold as it was when it was launched. Now, it is clear, if 1300*l*. was the market price of the vessel, and it had been lost when it was insured for 3000*l*., the owners would have been gainers of 1700*l*. more than they got for it, by its loss; if, when it was insured for 2000*l*., they would have been gainers of 700*l*.; and if, when it did get ashore, it had been lost, they would have been gainers of 400*l*. more than they got for it, or beyond the fair market price of it."

"But all this only proves that these vessels were insured above their value, and that they had deteriorated fast in value?"

"Yes; and shows how easy it is for a person to put a value on his own property above the market price of it; and shows what a strong interest he then has that it

should be lost; whereas, take away insurance, and his interest will just be reversed; and, as I have already said, as is the case with the royal navy and merchant vessels which are not insured, he will then be as anxious that his vessel should be preserved as he now but too frequently is that it should be lost; and just corroborates and proves what I said before, that more than half the wrecks and damages to goods is owing to insurance, which is a most iniquitous tax—a tax levied out of the pockets of the public for the benefit of parties, and the effects of which is productive of the crimes of perjury, fraud, robbery, and murder, or Burking of crews and passengers by wholesale."

"Why, these practices would be a disgrace to, and spurned at by, savages, let alone a nation calling itself the most scientific, moral, and intellectual on the face of the earth!"

"The late Captain Heywood, of the royal navy, was of opinion, that the less we taught savages of our arts and sciences, the better for their own happiness; and I am quite of his opinion, lest, with other arts and sciences, under the pretence of saving property, we teach them the art of Burking their fellow-creatures in the sea."

* * * * * *

"Why, I consider it worse than Burking, or Blood-money, since the miserable and desperate wretch, Burke, only committed single murders, but this is carrying on the trade by wholesale butchery—always taking it for granted, that these wrecks and loss of lives may be prevented."

"The preservation of lives forms no item in the calculation of profit; and I overheard a person say on this walk, after the loss of the Rothsay Castle steamer, that the whole lives which were lost in it were not worth a penny-piece."

"How did he make that out?"

"Because no man could make a penny-piece by them; and, therefore, commercially speaking, they were not worth a penny-piece. But, he admitted, that the loss of that vessel would do much good to both Sea and Life Assurance Companies, as it would cause many persons to insure both their lives and goods, who, for want of such mementoes, had become too confident, and they needed remembrancers of this kind to awaken them from their lethargy."

"And, by awakening them, to draw money from the pockets of the public to fill the pockets of the insurers?"

"Yes."

"*Mercy upon me!* such atrocities! Why, Flash-houses, Crockford's, Burking, or Blood-money, sink into insignificance before these wholesale butcheries, carried on under the appearance of trade!"

"You may say that, when you write to your friends, without telling a lie."

"Will no person who has had his friends drowned in the Erin, or other vessel, call public attention to the subject, and expose these atrocities?"

"That remains to be seen; but we have no Howards now-a-days. Though many may have the inclination, in general they want the means; and you know I told you before, that what is every body's business, is no body's business; and however disgraceful and criminal the practice may be, it will never be remedied until the public send forth its irresistible voice, and insist on its being remedied; and I do not think that is likely to take place soon."

"I am sorry to hear it."

"And I am sorry to express it; but not surprised."

"One question more, and I have done. How does it happen, that, in a country abounding with capital, and where railroads, bridges, tunnels, canals, aqueducts, docks, steam, chronometers, &c., have been brought to such perfection, we have not improved the construction of merchant ships, which are the vehicles of commerce, used on the great highway of nations?"

"Simply, because in a country abounding with capital, and where railroads, bridges, tunnels, canals, aqueducts, docks, steam, chronometers, &c., have been brought to such perfection, reward has attended success. But with merchant ships, which are the vehicles of commerce, in addition to the practice which prohibits strong ships being built, improvement in the construction would be so much against the interests of the revenue, and of underwriters, &c., that any person who should attempt to introduce it, would run no slight risk of being rewarded with a halter. But the grand and fatal error is, that, if you poll the British dominions throughout, you will find that 999 out of every 1000 individuals suppose that merchant ships and merchant steamers are built on the best known principles for safety; or that if any better principles were discovered, they would be immediately and voluntarily adopted, without reflecting that the interests of the revenue, of ship-builders, and the parties whom the leading THUNDERER OF EUROPE describes as equally 'sordid, obstinate, blind, and unteachable,' are directly and diametrically opposed to the interests of the public."

TAYLOR'S USEFUL GEOMETRY.*

The purpose of this little work is to supply that "large class of persons who have neither opportunity nor time to acquire a profound theoretical acquaintance" with the principles of geometry, but "are yet placed in circumstances requiring a correct knowledge of the results of mathematical investigation," with the limited extent of information of which they stand in need. The "results of geometrical science are presented rather than the deductions on which these results are founded, and the student's first steps are divested of every thing in the shape of theoretical rationale and speculative research." It is, in short, simply a book of problems, and instructions for their solution by rule and compasses.

The problems appear to us to be, on the whole, well selected, enunciated, and arranged. We must notice, however, a few exceptions. The student is taught by Prob. 17 "to divide a right line into any given number of equal parts; Prob. 23, "to trisect a given right line" is, therefore, superfluous. Prob. 76 should have preceded Prob. 51; and Prob. 77 preceded Prob. 48. In the enunciation of Prob. 27 we would substitute for the words "given two sides and one angle to describe the triangle," the following, "given two sides and the angle included between them to describe the triangle." So also in Prob. 28, instead of "given one side and two angles of a triangle to describe the triangle," we think the more correct enunciation would have been, "given one side and the two adjacent angles to describe the triangle." Prob. 84 is called the "Imperial Problem," on account of its being "proposed for solution by the Emperor Napoleon to the French mathematicians." This, though the popular history of the problem, is not the correct one. The problem first appeared in a work by Mascheroni, an Italian mathematician, which was translated into French in 1798. Mr. Taylor states the problem to be "to divide a given circle into four equal parts by the compasses only." The *spirit* of it would have been more correctly expressed thus, "to divide the circumference of a circle into four equal parts by means of *circles* only."

The directions given for the constructions are in general sufficiently plain, though often unnecessarily prolix. The author begs of the student who may be offended with such "pleonastic superfluity," to endure it "for the sake of those who may not be gifted with minds so energetically mathematical as his own." We cannot understand, however, why a prolixity, which contributes nothing to clearness, can be worth preserving for any body's sake. The directions for the solutions of Problems 13, 23, 26, 35, 36, 38, and 72, are all particularly faulty in this respect. Of actual error in the solutions there are but few instances. The construction given for Problem 47 "on a given right line to describe any regular polygon, *from a hexagon to a dodecagon inclusive*," will not, strictly speaking, hold good, except in the case of the hexagon. Under Problems 90, 91, 92, the author undertakes to show by means of circles how an ellipsis may be formed; but the figure produced in each instance is not an ellipsis, but an oval. No part of a circle can coincide with an ellipsis.

The blemishes we have noticed detract, however, but little from the general ability with which Mr. Taylor has executed the task which he proposed to himself, and may easily be remedied in future editions.

* Useful Geometry practically Exemplified by a Series of Diagrams; with a Vocabulary, explaining in Familiar Words the Scientific Meaning of Technical Terms.—By CHARLES TAYLOR. Sherwood and Co., 1833.

BENNET'S ARTIFICER'S COMPLETE LEXICON.*

We expected from the title of this publication a sort of Technical Dictionary—a real Lexicon—but find in its stead simply a Book of Prices, with occasional definitions of the more obscure terms and phrases. Take an example or two:—

"Bevel, for mechanics, 7½ inch, best T, each 2*s.* 9*d.*

"Bosses, brass, ½ inch, each 8*d.*"

What a bevel or a boss is, the reader is not told; though, had the work been a genuine Lexicon, an explanation of the meaning of the terms would have been the first thing thought of. As a Book of Prices, however, the work is likely to prove of extensive utility. The author states that it "has been the labour of some years;" and it bears all the marks of being compiled with fidelity and care.

* The Artificer's Complete Lexicon for Terms and Prices; adapted for Gentlemen, Engineers, Architects, Builders, &c. By JOHN BENNET, Engineer. Parts I. II. and III. To be completed in about Ten Parts. Published by the Author.

THE GLOUCESTER AND CHELTENHAM STEAM-COACH EXPERIMENT—FOREIGN PATENTS—QUALITIES OF COAL—INDIAN CORN MALT.

Sir,—I send you a miscellany of subjects:—

Steam Coaches.—If you inquire you will find that the road from Cheltenham to

Gloucester, on which the steam coach worked, is as nearly level through the whole distance as possible, which is proved by the fact that a rail-road, for carrying coal from Gloucester to Cheltenham, runs like a footpath by *the side* of it all the way.

Patents.—Do you think that patents here should be allowed for discoveries made in foreign countries, more especially if they are patented there? The invention is sure to come over in a very short time, and although patents are very just things, and in many respects very useful, yet the multiplication of them is a great evil to the manufacturer.

[The importation of foreign inventions is a thing to be encouraged by all expedient means. We would not, therefore, abolish patents for them altogether; but we think the period of their duration might, with great propriety, be reduced to one-half or a third of that for which patents for native inventions are granted. —Ed. M. M.]

Coals.—It would be very desirable if comparative experiments could be made upon coals, as to their power of burning lime or raising steam. The principal varieties of the coal of all parts of England and Wales ought to be tried—stone coal as well as other sorts. The provincial names, as well as the names of the pits, ought to be retained, the species mineralogically described, and the specific gravity given, or, at all events, the weight of a bushel, which would perhaps be better. I do not know a series of experiments more wanted. If five or six people in different parts would take up the subject in their different districts it might soon be done. It would be a very good subject for a premium from the Society of Arts, or for discussion at the General Philosophical Meeting which is so soon to take place at Cambridge.

Maize Indian-Corn Malt.—Can any of your correspondents tell me how Indian corn is best malted? A great deal of spirit is distilled from it in the United States.

Your's, &c.

J. D.

London Mechanics' Institution.—A Quarterly General Meeting of this Institution was held on the 5th instant. From the Report of the Committee of Management it appeared that the number of members, at the commencement of the quarter, was 1,112, at the conclusion 1,168; the receipts amounted to 442*l.* 10*s.* 10*d.*, the expenditure to 411*l.* 2*s.* 8*d.*, including 50*l.* paid to Dr. Birkbeck, which reduces the debt owing to him by the Institution to 3,050*l.* "An Old Correspondent" has *sent us a long paper of strictures on the proceedings of this meeting, but*, with the exception of the following passage, they turn on mere parish matters, with respect to which the public could feel no interest. "The selection of lectures," he says, "continues utterly unworthy of an Institution, the object of which is to communicate useful knowledge to the working classes. No less than nine lectures, delivered during the last four months, were on music and recitations, and, with the exception of one by Dr. Birkbeck, and four by Mr. Wallis, there was not one calculated for the instruction of mechanics. Yet while men of science are to be obtained for very moderate remuneration, and some gratuitously, the wise Committee have been paying five guineas a night to a piano-forte player, and the same sum to a spouter who amuses and instructs his audience by bad imitations, Joe Miller jests, ventriloquism, and buffoonery. Was it the intention of the founders of this Institution to instruct the working mechanics of London in piano-forte playing and ventriloquism?" Certainly, the intentions of the founders of the Institution were very different; but before we can conclude that the lectures here complained of have been improperly selected, we ought to know how many of the 1,168 members really belong to "the working classes." Why does not our "Old Correspondent," or some other member of the Institution, move for and insist upon such a return as would shew how the fact really stands? It is idle to complain of the Institution not being managed as a *Mechanics'* Institution ought to be, when it may perhaps turn out that it has no longer any claim to that appellation. As the number of members is not on the decline, it seems but fair to presume that the Committee have catered discreetly for the wants and tastes of the description of persons by whom chiefly the Institution is now supported.

Keys of Street Doors.—It is a usual practice with persons taking houses or premises, to receive the keys of the outer doors; these when tried on the locks are found to open them, and this, with many persons, is considered a sufficient security, without considering the quality of the locks, or *who* inhabited the house before, or of *what description the inmates were*, nor inquiring of the landlord *how many* keys there were to the street-door lock when the last occupier took possession. Several keys may have been made to the outer lock for the accommodation of lodgers or other persons. The consequence is that keys are often taken away, and many persons may have the same means of access to your house as yourself, when you imagine that all is secure. It is well known that robberies to a large extent have been effected by such means.—*Lawton.*

INTERIM NOTICES.

T—s H—d and S. D., in reply to Mr. Badnall, in our next.

"Evander" is mistaken. We have never said that steam travelling on common roads was "almost impossible." All that we have contended for is that quick steam travelling on such roads—at an average rate of fifteen and twenty miles an hour, for example—is never likely to be realised.

Communications received from Mr. T. V. Robson—Mr. Baddeley—T.—T. D.—Mr. Rutter—J. F. B.—Mr. Peacock—A Self-taught Mechanic—Mr. Ham—A Jeweller.

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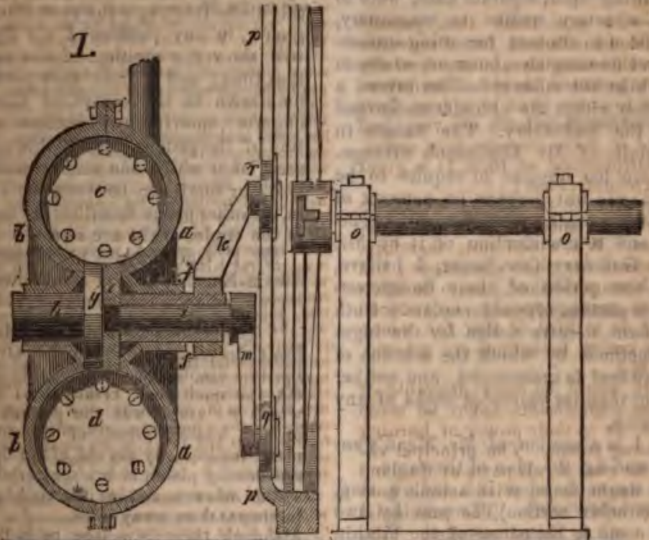
Mechanics' Magazine,

[M]USEUM, REGISTER, JOURNAL, AND GAZETTE.

[N]o. 515.] SATURDAY, JUNE 22, 1833. Price 3d.

MEAD'S ROTARY-ENGINE.

1.



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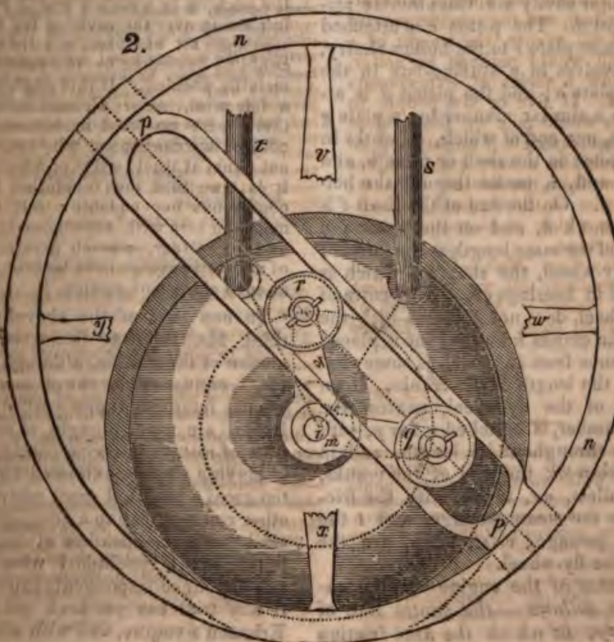


MEAD'S ROTARY-ENGINE.

Sir,—Some months back there appeared in the Mechanics' Magazine a scheme for a rotary-engine by Mr. Grahame, in which two pistons, enclosed in a cylinder and turning upon separate axes, were to impart a rotary motion to machinery, each piston in its turn becoming stationary, and forming an abutment or steam stop, whilst the other piston performed a revolution within the cylinder and urged round the machinery. The defects in the details of Mr. Grahame's arrangement are too obvious to require to be pointed out; but perhaps an account of Mr. Mead's engine upon the same *principle*, and a modification of it by Mr. Elijah Galloway (the latter, I believe, not hitherto published,) may be interesting to a portion of your readers. Both these plans deserve notice for the ingenious methods by which the rotation of the fly-wheel is maintained, and neither of them requires valves or cocks of any description.

Fig. 1 is a section of Mr. Mead's engine; and fig. 2 a plan of the same.

The steam-chamber is a hollow ring, (if a circular section), formed by two plates, *a* and *b*, bolted together. Within this circular cavity are two circular pistons, *c* and *d*. The piston *c* is attached by a circular plate *e* to the hollow shaft *f*, which revolves in a stuffing-box in the shell or plate *a*; and the piston *d* is attached in a similar manner by a plate *g* to a shaft, one end of which, *h*, works in a stuffing-box in the shell or plate *b*, and the other end, *i*, passes through the hollow shaft *f*. On the end of the shaft *f* is fixed a crank *k*, and on the shaft *i* a crank *m*, of the same length as the former; *n* is a fly-wheel, the shaft of which is supported in bearings *oo*. The centre of the fly-wheel does not coincide with the axes of the cranks *k* and *m*, but is placed at a distance from it, which is somewhat less than the length of the cranks. Upon the face of the fly-wheel, nearest the steam-chamber, is attached a bar *p*, with a groove throughout its length, and in this groove work the pins of the cranks, having rollers, *q r*, to diminish the friction; *s* is the steam passage, and *t* the eduction passage; *v*, *w*, *x*, *y*, are the arms of the fly-wheel.

The action of the engine may be explained as follows:—the centre line of *the groove pp*, in which the anti-friction rollers, *qr*, move, passes through the centre of the fly-wheel, so that in every position of the fly the rollers will be on some diameter line of the fly; and as in their revolution they describe the circle shown by dotted lines, the two points in which this circle intercepts the centre line of the groove, in any position of the fly-wheel, will show the position of the rollers at that time; and if from such points lines be drawn to the centre of the steam-chamber, such lines will indicate the position of the pistons. From this it will be seen, that whilst one piston traverses the space or small arc between the apertures *ts*, the other piston describes the remainder of the circle, or the arc *sxt*.

Mr. E. Galloway, in his History of the Steam-Engine, makes the following observations upon this invention:—

"The method by which he (Mr. Mead) has endeavoured to avoid the striking of the two diaphragms is probably the nearest approach to a removal of that evil which we stated was the probable cause of the abandonment of Hornblower's plan; for here, by the aid of the fly-wheel, the moving piston is brought gradually to a state of rest, so that the striking would be almost done away with. * * * Although there is reason to believe that the packing or wadding would be torn out in passing over the cavities for the admission and exit of steam, yet that difficulty could be overcome by the substitution of metallic packing. If this engine ever had a fair trial, under circumstances where there were no local inconveniences, we confess we cannot see why its effect was not equal at least to that of a beam-engine. It is true that the revolution is neither continuous nor equable; but this is no more the case with any engine in use, but, on the contrary, a much greater quantity of matter in others is to be brought to rest at each change of motion."

In one part of the above passage I think Mr. Galloway is not correct: the motion of the pistons, although not *equable*, is *continuous*; for the pistons, although greatly retarded at one part of the revolution, are never brought to an absolute state of rest, as in reciprocating engines.

Having already extended this letter to too great a length, I must postpone to another communication a description of Mr. Galloway's modification of this engine; but before I conclude I wish to ask if any of your correspondents can inform me if any trial has yet been made of Mr. Ericsson's engine, and with what result?

Perhaps "Mechanicus," who appeared to have peculiar sources of information respecting this engine, may be able to reply to these queries, and by so doing will oblige,

Sir, your obedient servant,
J. Murdoch.

THE UNDULATING RAILWAY.

Sir,—If I had thought that the subject of the undulating railway would have caused such contests among your correspondents I should, ere this, have claimed the honour of being admitted into the arena. I had the pleasure of meeting Mr. Badnall, on his arrival in London, in company with Mr. Locke, the resident engineer on the Liverpool and Manchester railroad; and I acknowledge that his assertion of the effect of "undulations" at first appeared to me a paradox, but it ceased to be so in the coach between London and Bristol. (By-the-bye, these fast coaches are excellent machines to promote thinking on such a subject.) On my return, I posted the annexed in our Mechanics' Institution. I have stated the problem in this manner in order to simplify it; and I will wait a few weeks for the solution, after which I intend to place it in a more "undulating" shape, and trust that I shall then have the pleasure of shaking hands (or pens) with Junius Redivivus, as a mark of union and cordiality in opinion on this as well as other subjects, notwithstanding my *cartel* to him in *Tait's Magazine* of this month.

Yours respectfully,
John Ham.

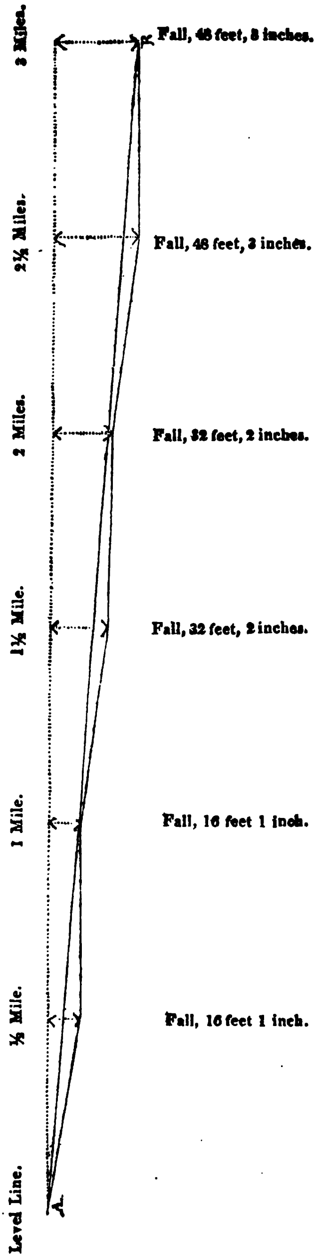
Bristol, June 4, 1833.

Railroad Problem.

Given.—A carriage having a locomotive power just sufficient to overcome and destroy friction; such carriage starting from A by the force of gravity alone.

Required.—The time, in minutes and seconds, in which the carriage would reach B on each of the two lines of road, supposing both to start from and end at the same points. No allowance for friction to be made by the terms of the proposition.

N. B.—The upper line is a regularly inclined plane, and the lower an inclined plane and a dead level every alternate half mile.



THE UNDULATING RAILWAY.

Sir,—Prior to my remarks on the undulating railway I had not seen the models. Since Mr. Badnall's reply in your last Number I have done so, and I trust the following experiment made by me upon them will convince Mr. Badnall that his notions on the subject are erroneous. He will see that the experiment is in effect the same as that before proposed; and I must add that the result completely fulfils my anticipations. I did not make any further experiments, presuming that his statements are to be relied upon; indeed, I have neither the right nor inclination to call them in question. Mr. Badnall defends his cause vigorously and openly, albeit, his challenge to the science of Europe is somewhat showy; and he eludes the grasp of his opponents with adroitness. But to our business. I desired the carriage to be placed at the centre or midway on the level line, and the spring wound up by drawing it backwards to the commencement of the line. It ran off the further end of the line. It was then placed a little short of the midway, and wound up as before; it reached the end, minus 3 feet, having travelled 55 feet. *Precisely* the latter experiment was now made on the curved line, and the carriage travelled 50 feet. Thus much for *space*. The *time* occupied in the experiment on the level was 19 seconds; on the curved line, 18 seconds. Then as 18 : 50 :: 19 : 53. Therefore, 2 feet more space (55 feet) was passed over on the level than on the curved line in proportionate times, or, in other words, the carriage went *farther* and *faster* on the curved line, the spring and the impetus acquired by the carriage *being allowed to operate freely and become exhausted* on both lines. It is proper to state that the experiment was repeated two or three times with very nearly like results; the additional carriage with the weights in it being attached as usual, I suppose. I also allowed the curved line the advantage of its greater length in winding up the spring, seeing that the difference in this respect was small, and being at present rather disposed to think it the correct method. It implies, however, a greater expenditure of power.

Now a word or two in reply to Mr. Badnall's answer to my previous communication. He appears to suppose that a carriage running down an inclined plane will never reach its maximum velocity. Is, then, the force of gravity so different from other forces that it cannot be counteracted by friction? Again, what but friction alone determines the velocity on a plane, omitting, of course, in both cases, the limit imposed by the action of engines or other moving powers? That a body would descend one side of a curve and rise to the same height on the opposite side, if it were not resisted by friction and the air, is indisputable. So, also, if a body were set in motion (or it might in such case be *found* in motion) on a plane, omitting the like resistances, it would continue to move. Friction, then, I repeat, is all we have to consider in the question at issue. I have proved, by experiment on Mr. Badnall's own models, fairly constructed I have no doubt, that it is *greatest* on the *longest* line. It must be so. The relief from pressure or friction, or any thing else on the descent, is counterbalanced on the ascent; because the curve is then opposed to the *natural* path of the carriage. I will just notice that the number of curves in the model is too small to give a very correct result. I leave some singular and unquestionably false conclusions of Mr. Badnall to be answered by those of your correspondents to whom they more particularly apply.

I am, Sir, your obedient servant,

T—s H——D.

London, June 11, 1833.

Sir,—Having read Mr. Badnall's remarks in your last Number, I was about to modify an opinion I expressed in a former letter, that there was an accession of force by acceleration in the spring during the progress of the carriage on the undulating railway; but, on second thoughts, it has occurred to me, that though a fusee does equalise the varying forces of a spring when the resistance and rate of motion are uniform, it does not follow that it is a perfect counterpoise when the velocities vary so greatly as they do in the present case; in other words, it appears to me, that, owing to the rapidity of the descent, the intensity of the spring decreases in a less ratio to the quantity of it which is unwound than on the horizontal railway; and before the accumulation of force thus implied has time to exhaust itself on the ensuing rise, the carriage has reached the apex, the spring relaxes its extreme tension,

; to recover its force, gains again e axle down the second descent, on through the successive un- is.

n in my first letter I spoke of the of the spring upon the axle, I not to distinguish it from that akes place on the horizontal line, n that which would be in practice power were substituted for that the experiments.

t Mr. Badnall says on this point I able to controvert, though I think :ulates too much upon the mo- a when he says, that "the steam ot be employed throughout the ength of each undulation."

o. 509, p. 93, you have given a a from Mr. Badnall's work. In it ain lines, as CP, CG, represent- pressure on the rails EB, EA. . Badnall says, "that throughout ent the pressure upon the rails, sequently *the amount of friction, uch less than it was on the hori- line EA as the line CD to DG.*" mer letter I ventured to substitute CG; and I think, if the author it again, he will approve of the m.

uiesce in the propriety of the ob- n, that the quantities CD, CD, as pear on either side of the undula- are altogether distinct from fric- it appears to me, however, that the friction is less on any indi- point of the undulating line, the mount of it is as great as on the tal line, because there are more f contact; and on this account I at there is nothing gained in the nt by that which is assumed in on with the calculation contained 95th page.

m, Sir, your obedient servant,

S. D.

-Can you spare me a corner in agazine for the following:—

: to p. 93, and suppose the hori- length from A to E = 16, the ?B = 6, the length of each in- lane will = 10, and the pressure the plane, and therefore the fric- cording to Mr. Badnall, will = 8 friction on the level. Let the *traction, to maintain* any given *on the level,* = *n pounds;* then *ion on the inclined plane at the same uniform velocity* = 8 *n* pounds. The power expended on moving the wheel from A to E upon the horizontal line = 16 *n* pounds; and upon the plane the power expended = 20 × ·8 *n* pounds = 16 *n* pounds as before. But the *time* on the inclined planes = 1¼ times the time on the horizontal rail, because the velocity of the wheel is the same in both cases, and the planes are 1¼ times the length of the horizontal rail.

But Mr. Badnall will say, "gravity will cause my carriage to travel faster down the inclined plane than the average velocity here spoken of." Admitted: but if it travels faster, the tractive power which the friction, &c., renders necessary must also travel faster, or, in other words, more power must be expended; and we can always gain speed at expense of power without the inconvenience of curved rails. In the pendulum, which seems the basis of Mr. Badnall's hypothesis, the entire power which is gained by the descent is expended on the ascent, and so it must be with his railway-carriage; and as to the time required on the curve, I think, from the above examination of the inclined planes, there seems good reason to believe that with the same power it will be greater than on the horizontal rail.

This question will naturally arise, "How is it that Mr. Badnall's experiments seem so conclusive in favour of his hypothesis if that hypothesis is ill-formed?" I have not the least doubt that the results of the experiments are the consequences of peculiar circumstances which have not been attended to.

I shall not occupy your space with any remarks on the *practical* objections to this plan; as it is to be tried on a large scale, they will doubtless manifest themselves.

Yours, &c.,

S. Y., an Engineer.

16, Lambeth-terrace, June 15.

[We have received from Mr. Badnall, and shall insert in our next Number, a section of a branch line of railway which is now making from the Whiston Collieries to the Manchester and Liverpool main line; "on which," says Mr. Badnall, "I have denoted three different undulating lines, each, in my opinion, well calculated to prove the fallacy of my principle, or to establish beyond all question its merit and importance." It is accompanied by an explanatory letter from Mr. Badnall.—Ed. M. M.]

TABLE OF THE LEVELS OF THE PIERS OF BLACKFRIARS BRIDGE,

(Referred to in Messrs. Walker and Burges's Report.)

Level of Course or Base on which the Columns stand below the Trinity High Water Mark.

		Middlesex Side.	1st Pier. Ft. In. Pts.	2d Pier.	3d Pier.	4th Pier.	5th Pier.	6th Pier.	7th Pier.	8th Pier.	Surry Side.
West Face.	North Should.		0 9 3	0 8 1	0 8 6	1 1 0	0 11 2	0 7 9	0 9 2	0 10 6	
	South Should.		0 9 3	0 7 1	0 7 8	0 10 5	0 10 8	0 9 8	0 11 9	0 11 5	
East Face.	North Should.		0 10 7	0 8 5	0 9 1	1 0 5	0 10 3	0 10 3	0 8 7	0 11 7	
	South Should.		0 9 3	0 8 2	0 8 3	0 10 3	0 10 4	1 0 4	0 10 3	1 1 1	

Mem.—The level of Trinity High Water is cut into the masonry on the north side of the centre arch thus:—

TRINITY
H. W.
1800.

MR. HALL'S STEAM-ENGINE IMPROVEMENTS.

Sir,—Absence from home has prevented my earlier notice of the last effusion of Mr. J. Ride, and were I now to occupy your valuable pages with a particular reply, I should certainly consider myself deserving the epithets he has so freely bestowed, apparently forgetting, from the very first, that it was the merit of inventions, not of individuals, that was under discussion. I will, with your leave, now close my side of the question with the following observations.

As my opponents still contend that *multiplicity of parts*, attended as it ever must be with increased labour, as well as many other concomitant evils, does not constitute *complexity*, I shall say no more about either piston or valve, particularly since it has been admitted that they fall so far short of perfection that neither of them is steam-tight without the lubrication. For this wonderful lubrication there is claimed, 1st, the annihilation of friction! amounting to one-third the power of the engine, (see p. 185, last vol.) wanting *confirmation* only to account for half the stated saving; and, 2d, the prevention of, and consequent loss from, the escape of steam past the piston and valves. How this escape is avoided with the *vertical* slide we are left to guess; but it is said to be effectually prevented in the piston by a half-inch stratum of oil floating on its top; forgetting that, however this may be in the downward, it cannot prevent any escape in the upward strokes. Besides, to argue that the escape altogether is considerably less than half a cubic inch for each revolution of the fly-wheel, is in fact to admit that the saving is, after all, scarcely worth consideration.

The principal saving arising from the improvement in condensation is attributed to a reduction in the size of the air-pump. To what extent this reduction is carried does not appear; but the statement, that the work to be done by the air-pump, where there is no injection-water to remove, is so very small as to be beneath notice, would almost lead us to believe that, like friction, it might be annihilated altogether. If so, what a fool Watt must have been to make the dimensions of the air-pump so greatly to exceed those of the cold-water pump! But *apropos* of this cold-water pump: is it not strange that Mr. Hall and his friends should never say a word about it? What if its dimensions should, according to this new method, be considerably *increased?* I have from *experience* great reason to think that this must in fact be the case.

After all, however, it is not by arguments, but by facts, that the value of Mr. Hall's alleged "improvements" must be determined; and that is a test to which they have yet to be subjected. Hitherto we have had nothing but mere assertions; and yet, on the strength of these assertions, we are called upon to believe that this *untried* steam-engine *must and will supersede all others, and is, moreover, to form a new era in their history!* I say untried advisedly, for although the pa-

tentee has had one at work at his bleach-works some eighteen months or so, nothing more has yet been ascertained than the difference in the consumption of fuel. To be sure, something is said about its doing more work; but as it is also said to be impossible to ascertain the amount of work done (the engine driving machinery of uncertain power), it is only fair to infer that it is still undecided whether the power of the improved engine is equivalent even to the reduced consumption.

Mr. Ride's personal appeal to you, Mr. Editor,* is as useless as that to the public through the medium of certain subservient lecturers at the Southampton-buildings' puff-shop, as neither can by any possibility throw a light on the grand points at issue, viz. utility and economy. The only way in which these can be decided is by the speedy erection of the promised engine, and connecting it with machinery whereby its power can be as satisfactorily ascertained as the consumption of fuel.

Yours, very respectfully,
T. V. Robson.

June 1, 1833.

Erratum.—P. 440, col. 2, line 52, for "cold air" read "cold oil."

* It is proper to state, that the Editor has not yet been furnished with the "ocular demonstration," which Mr. Ride promised (p. 227).—Ed. M. M.

FARTHER PARTICULARS OF THE NEWLY-DISCOVERED SUBSTANCE THIOGEN.

Sir,—I am obliged to you for the insertion of part of my letter to you; I now intend to give you some more account of my experiments.

I enclosed some sulphur in a glass tube of 2 feet long by 1 inch in diameter. I passed a very fine spiral wire through the sulphur, and then fixed the whole in a metallic lightning conductor, which was insulated above the sulphur apparatus. The glass tube was so contrived that any air coming from it would pass into a receiver placed for its reception. I now waited for the lightning to pass down the rod, and had in only two months to witness the effects of it on the sulphur, as a violent shock of lightning passed down my conductor. On visiting the spot, Sir, judge of my joy when I found the spiral wire fused, and the lower part of the sulphur changed into a powder as white as snow, and my receiver full of hydrogen. I have named this new substance Thiogen: its specific gravity is 1.707. It has a great affinity for hydrogen, and converts muriatic acid into chlorine. It converts oil and fat into carbon in quite a new state, the carbon being white, soft, and nearly transparent, after having lost its hydrogen.

Thiogen decomposes phosphorus by depriving it of hydrogen; the remaining part is a new and very inflammable gas, the colour of chlorine.

I am now making use of an electrical kite to bring electricity to my conductor.

If these experiments are worthy a place in your entertaining Magazine I will communicate more to you at another time.

I am, Sir,
Your obliged humble servant,
J. M. Corbett.

Salop, June 13, 1833.

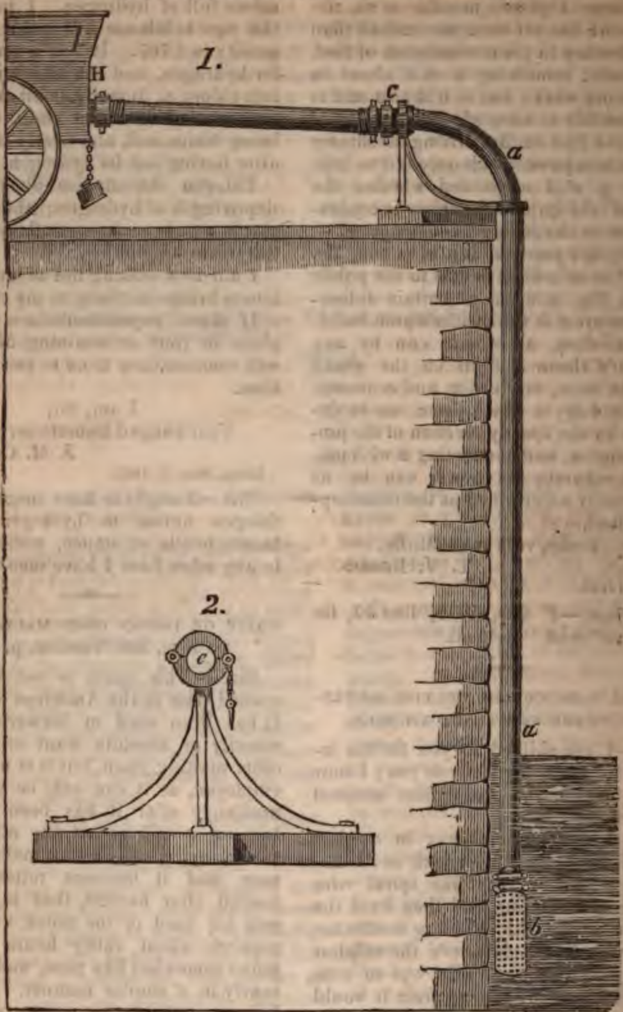
P.S.—I ought to have mentioned that thiogen united to hydrogen forms a brown brittle substance, unlike sulphur in any other form I have seen it.

MAIZE OR INDIAN CORN MALT.—ANSWER TO J. D., last Number, p. 176.

Sir, — This grain is *not* used in a malted state in the American distilleries. It has been used in breweries, in the scarcity or absolute want of barley or other malting grain, but it is now seldom employed, as it can only be malted immediately after it has been harvested, because it will not at any other period take watering sufficient to make it germinate, and it becomes rotten. When malted after harvest, that is, before it gets too hard or too much dried up, it requires about thirty hours in steep, grows somewhat like peas, and is malted nearly in a similar manner. There is a full account of the process of malting this grain attached to Coppinger's excellent Treatise on Brewing, published in New York or Philadelphia, in 1808 or 1809 (which see). If this work is not to be readily procured in London, and more on the subject is deemed worth paying for, full information of its use in distilleries, &c. shall be given by the subscriber, on application by letter, addressed General Post Office, till called for.

R. C., Brewer and Distiller,
Utica, N. Y.

ON THE SUPPRESSION OF WATERSIDE FIRES.



Sir,—It is often matter of surprise that fires should extend in the manner they sometimes do by the water side, on wharfs, in docks, &c., when the proximity of an abundant supply of water would induce the belief that every facility existed for the speedy suppression of the fire.

There is a much greater difficulty, however, in making this supply available than is generally imagined; the *water is mostly from* ten to fifteen feet *or more below the level* of the wharf, &c., *and when the quantity of* leather suction-hose necessary to enable an engine to work from this depth is taken into consideration, together with the difficulty of keeping that quantity sufficiently air-tight, the magnitude of the evil becomes apparent. After the extensive conflagration at Liverpool, in January last, it occurred to me that a portable metallic suction-pipe, of a simple construction, would greatly obviate the inconvenience in question. The arrangement I am about to describe at that time suggested itself to me, and other conflagrations have since shewn the propriety of adopt-

ing this or some similar contrivance. Two or three of them, placed on a wharf or dock where fire-engines are kept, would ensure a copious supply of water without much trouble or delay.

In the accompanying sketch *a a* is a thin copper tube, about fifteen feet long and two inches in diameter, having a male screw at its lower extremity, to which may be attached another ten feet length of tubing, or a perforated rose or drain *b*, according to the height at which the water stands. At the upper end, which is curved, there is a female swivel screw *c*. Fig. 2 is a front view of the stand or support for the metallic suction, consisting of an iron tripod mounted on a wooden T frame. At the top, a collar *e* 'is made to open with a hinge joint, and secured by a pin passing through the other side. The upper portion of the suction-pipe *a* has a grooved neck just behind the swivel screw, which is taken into and firmly held by the jointed ring *e*.

In fig. 1 the apparatus is shewn in use; H is the hinder part of a fire-engine, to which a single short length of leather suction-hose is attached, the other end being screwed up to the metallic suction. Where the ground is tolerably even, and the apparatus of the proper height, the apparatus may be attached directly to the engine; where it is otherwise the leather hose is an easy mode of effecting the communication.

It at one time occurred to me to make the apparatus a *fixture*, finishing the upper part like some of the street *fire-cocks;* but the portable one would be in every way so much superior and economical, that I would recommend it in preference.

Your's respectfully,

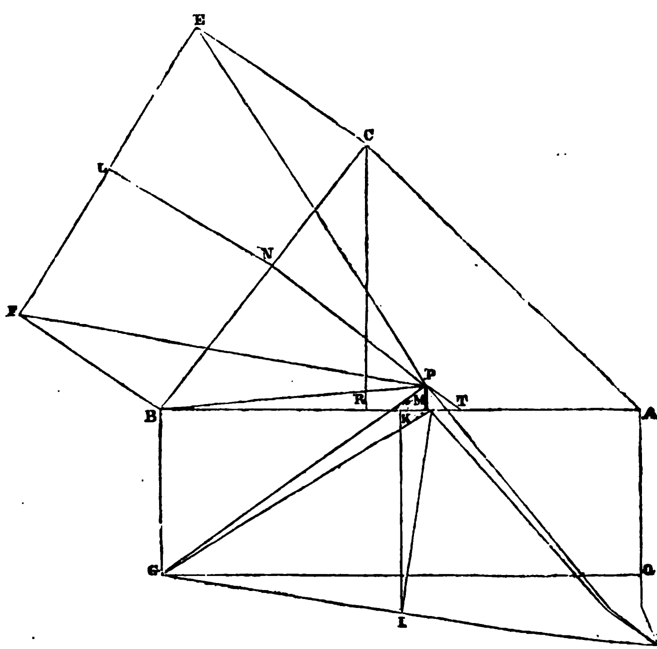
W. Baddeley.

London, June 10, 1833.

SOLUTIONS OF THE 11TH MATHEMATICAL QUESTION, last vol. p. 158.

Question.—Three poles, A, B, and C, are perpendicular to the horizon; their heights are, 50, 35, and 44 feet respectively; and the horizontal distances between them are AB = 100, AC = 80, and BC = 70 feet. Required to find a point in the horizontal plane B, equidistant from the tops of the three poles, and calculate the length of that line.

By Lictor.



Let the right lines joining A, B, and C, represent the distances between the poles

at the horizon; make CE and BF perpendicular to BC, and BG, AH, perpendicular to AB; let CE be taken equal the pole C, AH = the pole A, and BF and BG = the pole B; draw EF and GH; which bisect by the perpendiculars LN, IK, cutting AB, CB, in N and K; draw MP and NP perpendicular to AB, BC, and the intersection P of the perpendiculars will be the point sought.

Suppose the planes CEFB, ABGH, to be turned up, so as to stand perpendicular to the plane of the horizon ABC, and intersect it in the right lines AB, CB; then because BF and BG are equal to each other, and perpendicular to the plane of the horizon, it is evident that the points F and G must coincide, and that CE, BG, (BF) and AH, will represent the true position of the poles.

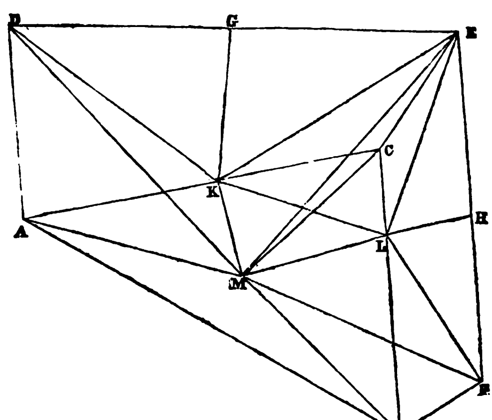
Join MG, MH, PG, PH, PE, and PF; then, since GI = HI, and the angle GIM = HIM, GM is equal HM, and because MP is perpendicular to AB, it is also perpendicular to the plane BAHG, and consequently the angles PMG, PMH, are right angles; and as the angles GMP, HMP, have two sides and an included angle equal, the remaining sides PG and PH are equal.

In the same manner it may be proved, that PE = PF. Let fall the perpendicular CR, and produce NP to T, also make GQ parallel and equal to AB; then, by similar triangles QG : GH (= AH−BG) :: KI $\left(=\frac{BG+AH}{2}\right)$: KM, and KM + ½AB = BM. In the same manner may BN be found. Now, as the triangle ABC is given, the perpendicular CR, and the segments RB, RA, are also given; hence by similar triangles, BR : BC :: BN : BT, but MT = BT−BM ∴ CR : BR :: MT : MP, and (Euclid 47. 1.) $\sqrt{PM^2 + BM^2 (= BP^2) + FB^2} = FP = 66{\cdot}3749 +$ the line sought.

LICTOR.

By E. J. Erichsen (the Proposer).

Construction.



Let ABC be the bottoms of the poles; DEF, their tops. Join AB, BC, AC, DE, EF; bisect DE, EF, in G and H, and in the vertical planes DC, BF, draw GK, HL, perpendicular to DE, EF, meeting AC, BC, in K and L. Join DK, KE, LE, LF, and in the horizontal plane ABC draw KM, LM, perpendicular to AC, BC, meeting in M. Join MD, ME, MF, MA, MC, MB; then will MD=ME=MF. Comparing the triangles DGK, EGK, DK = EK; and because the two planes DC and ACB are perpendicular to one another; and KM is perpendicular to AC, the common section of these planes ∴ the angles DKM and MKE are right angles. And since DK = KE, and MK is common to the two triangles DKM and EKM ∴ MD = ME; in the same way it may be demonstrated that ME = MF.

Calculation.

Assume $KC = x$ ∴ $AK = 80 - x$ ∴ $50^2 - (80-x)^2 = 44^2 + x^2$, from which x or $KC = 43{\cdot}525$. In like manner LC is found to be 29·921.

Also as $2AC \cdot BC - 11200$ . .		4·0492180
to $AC^2 + BC^2 - AB^2 - 1300$.		3·1139434
As radius		10·0000000
To cos. $\angle$ C 83° 20′ 4″ . . .		9·0647254
As KC + CL	73·444	1·8659681
To KC − CL	13·604	1·1336666
So tang. ½ (L + K)	48° 19′ 58″	10·0506415
So tang. ½ (L − K)	11° 45′ 26″	9·3183400

Hence the angle CLK = 60° 5′ 24″. Join KL, and because the angles CKM, CLM, are right angles, the four points K, C, L, M, are in the circumference of a circle $\therefore$ the angle CMK = CLK; hence

As sin. KMC	60° 5′ 24″	9·9379258
So radius		10·0000000
So KC	43 525	1 6387394
To CM . . .	50·213	1·7008156

Lastly, ME $= \sqrt{MC^2 + CE^2}) = \sqrt{4457 \cdot 345369}) = 66 \cdot 764$ feet, length of the required line.

E. J. Erichsen.

Mansion House, Hammersmith, March 15, 1833.

[" Lictor's" solution is, on the whole, a very good one, and for all practical purposes as correct as that of the proposer, Mr. E. J. Erichsen. Mr. S. Wheatley, of Belper, has sent us an answer, which agrees in the final result with Mr. Erichsen's, but is deficient in not giving, as required, a geometrical construction. Mr. A. Mackinnon has also favoured us with a solution which, like " Lictor's," is correct to within a fraction or two. The answers of " H. D. C."—" Juvenis"—and " A Constant Reader" (at Clifton), are all, as they will perceive, very wide of the truth.—Ed. M. M.]

LORD EBRINGTON'S BILL FOR THE REFORM OF WEIGHTS AND MEASURES.

Lord Ebrington has obtained leave to bring in a Bill for the repeal of the 16th clause of the Act of 1826. The 16th clause provides, " that it shall be lawful to buy and sell goods and merchandise by any weight or measures, established either by local custom, or founded on special agreement."

By the 10th clause of the same Act it is provided, that corn shall be sold in Ireland by weight. Ireland is the granary of the British manufacturers. In Liverpool and Glasgow corn is sold, not by measure, but, as is the practice throughout Ireland, by weight, with reference to measure. For instance:—

280 lbs. weight of wheat = 1 Irish imaginary barrel
¼th = 70 lbs. weight = 1 Liverpool bushel.

The Legislature having enacted that coal shall henceforward be sold, not by measure, but by weight, the principle is recognised that corn should also be sold by weight. While corn continues to be sold in Ireland, Liverpool, &c., by weight, and elsewhere in the United Kingdom by measure, the corn averages must continue to be fallacious.

In the Report, printed by the House of Commons on the 28th May, 1821, the Committee on Weights and Measures state, that they " have reason to believe, that the Imperial measures will be adopted by the United States, and thus tend in no small degree to facilitate the commercial intercourse, and by so doing to consolidate a lasting friendship between the two great nations of the world most assimilated by their language, their laws, religion, customs, and manners." Have the people of the United States accepted this invitation? No.—Have the English colonists adopted the " Imperial" measures? No.

There are *40 cubic* English or Russian feet to the marine ton,
10 cubic English or Russian feet consequently to the quarter of a marine ton of wheat.

There are * 2 cubic English or Russian feet to the *Fanega*, the *standard* measure of capacity of the Spaniards and Portuguese throughout the world, which contains of rain or distilled water 2,000 ounces; or 100 lbs. weight of either alcohol or wheat. This is 500 lbs. weight English, Spanish, or Portuguese to the English quarter of a marine ton of wheat. There are 500 English lbs. weight to the candy, or quarter of a ton of the Birmese empire. $\frac{1}{20}$= 25=1 Madras maund, or Spanish arroba. The lack of rupees is 100,000=40,000 ounces=1 English marine ton.

The Mahometan divisor is $\frac{1}{40}$=2,500=1,000=1 English or Russian cubic foot of pure water at the greatest condensation. It is evident that the exchanges of the great majority of the world are derived from the English or Russian foot.

In the Appendix to the Parliamentary Report, the Commissioners state that "water attains its greatest density at 39° Fahrenheit." *This statement is erroneous.* The French Academy of Sciences agree with M. Lefevre Gatineau, that "water attains its greatest density" at 4° centigrade. The commercial exchanges, which have existed *from the earliest periods*, are not to be thrown into confusion because, forsooth, certain old England philosophers must swing their pendulum at 62° Fahrenheit.

When the Portuguese discovered the East Indies they found the very same system of monies, weights and measures which had been introduced into Spain by the Saracens. There are 400 Portuguese or Brazilian reas to the Bombay rupee, as at the cession of that presidency. The ounce of silver, or mil-rea, is exactly the $\frac{1}{1000}$ part of the English or Russian cubic foot of water, which is in the exact ratio to the Chinese ounce of silver of 1,000 cash, as 4 is to 3. This important commercial fact has been *proved* to Parliament by Mr. Bates, the acting partner of the house of Messrs. Baring and Co., who has resided in Asia; and by Mr. Thornely, the eminent Liverpool merchant, who has resided in America. The people of the United States, who are anxious to monopolise the carrying trade between the European and American Spaniards and Portuguese, have rationally rejected our *soi-disant* "Imperial" standard.

The world being principally supplied with gold and silver by the Spaniards and Portuguese in North and South America, and England being principally supplied with wines by the Spaniards and Portuguese in the European peninsula, and also with wheat, in a large and annually increasing quantity, from the North of Spain, the weights and measures of those countries ought to be placed on their natural *footing*. This question was lately submitted by Sir Stratford Canning to the Spanish government.

Not only have the Americans, the colonists, the Irish (and Ireland is the first export corn country in the world), but also have English farmers, as Lord Ebrington has stated to the House of Commons, rejected the "Imperial" measure. It is a published fact, that at Devizes, the Marquis of Lansdowne's English market, a certain number of the neighbouring farmers have resolved to sell by the Winchester bushel, the remainder by the "Imperial." It is so in Kent, Devonshire, and several other English counties. Lord Ebrington's Bill is then a *leader* to Lord Althorp's Bill for the Commutation of Tithes for "Corn Rents." Under existing circumstances the corn averages are fallacious! How does Lord Althorp propose to determine the quality of corn for the payment of tithes in "corn rents?" The quality of the foreign and colonial corn which is imported cannot be determined! A humorous *Chevalier*, in the Quarterly Review for January, 1831, is pleased to tell us, that "among the pleasant devices of the Laputan members was one which disturbed the whole system of weights and measures throughout the land, for no other alleged or conceivable reason than that the said weights and measures should all be reduced to the standard of Laputa. Whether this has occasioned more roguery or inconvenience is a question which might exercise the skill of those philosophers to resolve."

Of course, the measure of capacity not being derived, as it ought, from the lineal measure, the excise officers are gauging in the dark, the light being hid under the "Imperial" gallon. The cubic contents of the "Imperial" gallon is stated in the Act of 1826 to be 277.274 cubic inches. Now 2 English or Russian cubic feet=

* Read the 19th and 20th Articles of the Constitution of the Cortes.

; inches. The pint being=34.56×8=276.48 for the English gallon of water, e tithe or tenth of 100 lbs. weight English, Spanish, or Portuguese, of either ol or wheat. The Commissioners of Weights and Measures have then, despite ; Quarterly Reviewer, established one great principle of national accountability ; measure of capacity. The error is only material in wholesale transactions.

e now come to Mr. M'Culloch, who tells us that "the greatest blemish by ') in the new Act is, the continuance and legitimation of the practice of selling :aped measure. We are astonished at the the toleration of such a *barbarous* m. All articles that may be sold by measure, ought to be sold by weight." Mr. illoch must now be delighted that Parliament have declared that those rned gentlemen in black," the coal-heavers, are not very learned in conical ns.

e Spaniards subscribe to the opinion of Dr. Adam Smith, that wheat is a ard of value.

rliament having recognised the principle, that dry merchandise ought to be sold eight, were Lord Ebrington's Bill to provide that corn may be bought or sold by esale throughout the United Kingdom *legally*, only by weight of 100 lbs., there l be but 20 instead of 32 measures to the marine ton;

5 instead of 8 measures to the quarter.

cargo would be more expeditiously discharged. At the first glance of a news- his Lordship would perceive the comparative prices of corn—wheat, barley, oats—on his Waterford and Devonshire estates;—the corn averages would be calculated, the corn rents for tithes would be determined by the corrected perial" gallon, the strength of the Spanish and Portuguese wines would be nined, and, finally, the English, East Indians, Spaniards, and Portuguese or lians, and Russians, would have one measure of capacity for their joint stand- f weight, which is *arbitrarily* to the Chinese as 4 is to 3.

T.

THE OXYHYDROGEN MICROSCOPE.

, — On Saturday last I had the ire of seeing the oxyhydrogen mi- pe.

; first portion of the exhibition con- of the wings of insects magnified 0 times, and so as to appear from feet in length, according to their Then followed "delicate slices" getable substances—fruit and wood, English and foreign. I observed the latter showed, in their dark and close texture, a structure cor- iding to their increased weight, and e thought whether this relationship iot be so close as to be of service in aining their specific gravities. The ; were all cut across the grain. Fol- g these were two artificial objects— s of the finest texture; their coarse- when contrasted with the finer of nature was strikingly displayed. ppeared like the coarsest horse-hair ig, the other like a fishing-net. It hown that our finest spinning and nest weaving were too rude to bear irison with those things which are owth of earth and air. And it was ked, that the more we examine the minutiæ of nature the more elaborate and perfect its performances appear, whilst the works of man, under similar scrutiny, appear in proportion less admirable and perfect.

The second part of the exhibition was of a more exciting kind; the power was raised to 500,000 times, and the divergent rays covered the whole disc of 13 feet diameter. First, we had insects of one kind in succession. One was a beautifully transparent one, in which we could see several fluids circulating through every part of its body; in another the heart was seen to beat with wonderful freedom, it was stated to be the most beautiful creature in the waters of this country. The flea was also shown, and the mechanism of its leap explained. The next thing was a drop of sour wine, in which was an assemblage of animals, receiving from the lecturer the character of "a very intelligent and benevolent people!" Interesting they certainly were, but nothing to compare with the grand development which followed, designated "the water lions seizing their prey." This was produced by the union of two

waters, and was indeed a conflict of no ordinary kind. A piece of coral was then put in the water, and the insects grew upon it, multiplying in a few minutes to the number of some hundreds. This closed the exhibition.

I am, Sir, your obedient servant,

S. D.

ELECTRICAL PROPERTIES OF CAOUTCHOUC.

Sir,—In my communication at p. 89, I intimated that I would give you some further information respecting caoutchouc balls.

Mr. Baddeley disapproves of my placing the caoutchouc in water. I have never found that the water acted injuriously upon it. I am, however, greatly obliged to that gentleman for the hint. I ought perhaps to have stated, that my only reason for immersing the bottle in warm water was that it might more readily acquire an uniform temperature. In the subsequent part of the process of inflation I employ dry heat precisely in the way that Mr. Baddeley has described. Junius Redivivus says, oil is a slow solvent to caoutchouc; that is a fact worth knowing. Junius will be pleased to acccept my thanks for it.

A few months ago a friend of mine, Mr. W. Dixon, having seen at my house two or three of the balls that I had inflated, as already described, on his return home commenced operations much in the same way, and, elated with his success, took the ball he had made into the parlour to shew his wife. It happened that Mrs. Dixon was engaged in sewing. On bringing the ball near for her examination, Mr. Dixon observed that the thread his wife was using was powerfully attracted and repelled by it. After repeated trials Mr. Dixon satisfied himself that the cause of these alternate attractions and repulsions was electricity. On the following morning he kindly communicated to me the result of his observations, with a request that I would investigate the matter further.

I had hoped and intended, Sir, to have gone carefully through a series of experiments previous to my making this communication to your pages. My occupations of late have prevented me from doing as I wished. I have now no immediate prospect of commanding sufficient leisure to pursue this new and interesting subject further than I have already done. I trust, therefore, that your readers will pardon me that my remarks will necessarily be "rough notes," when they ought to have been the result of accurate investigation.

After trying a variety of experiments with caoutchouc balls of different dimensions, my friend and I agreed to mount one, so that it might supply the place of the glass cylinder, or plate, of an electrical machine. Mr. Dixon having a small plate machine, the plate was speedily disengaged, and a ball fixed in its place of about 9 inches diameter. It fully answered our expectations.

Thus encouraged I caused to be constructed a simple apparatus, to which I adapted a ball of about 14 inches diameter. Its effect, when put in motion, and rubbed with the hand, was precisely similar to that of a small electrical machine of the usual form.

Caoutchouc in its ordinary state, *i. e.* in solid masses or in bottles, is, in common with other resins, an electric, but in a very slight degree as compared with sealing wax. When inflated the electric properties of caoutchouc are more easily and more abundantly developed than in any other substance with which I am acquainted. A single stroke of the hand, on a moderately-sized ball, I have found to excite sufficient electricity to affect a gold-leaf electrometer at a distance of 6 inches. With a ball firmly grasped by one hand, and rubbed briskly by the other, I have caused a very sensible agitation of the gold leaf at a distance of four feet. Several times, by the proximity of the ball, when in a highly excited state, to the electrometer, the gold leaf has been torn asunder, and scattered in fragments on the sides of the glass vessel in which it was suspended.

Attached to suitable apparatus, and worked as an electrical machine, I have with a caoutchouc ball performed most of the simple illustrative experiments that can be effected with a 5 inch cylinder, or a 10 inch plate machine. The spark from this machine is less brilliant than that from a glass machine. It appears to me of a pale blue colour.

The greatest striking distance to which I have yet attained is $\frac{4}{10}$ths of an inch. With a two ounce phial, charged by the

caoutchouc machine, I have given to others and received myself a shock that was quite as powerful as could be borne without producing inconveniently painful sensations.

The chief difficulty in the use of these balls is in collecting the electricity generated on their surface. Perhaps in proportion as the caoutchouc is attenuated, so may it become a more perfect non-conductor. I find the electricity adheres to it with a kind of stubborn tenacity, that implies the most favourable condition of a non-conducting substance. Many times I have made a communication by means of a ball between the conductor and the axis of a 24 inch plate machine; but I have never found its electric action interfered with.

The caoutchouc machine is less affected by a humid atmosphere than the glass machine. It requires no amalgam, and no rubber excepting the hand of the operator. I have used silk, woollen cloth, and fur as rubbers, but the maximum effect has always been more easily attained by the hand alone. An occasional substitution of a silk handkerchief instead of the hand may be desirable; but this is only for the purpose of removing any adhering perspiration, and may soon again be dispensed with. There are many reasons that induce me to prefer the hand as a rubber, and they will readily suggest themselves to those who may take the trouble to verify these observations.

I have already hinted that my machine is exceedingly simple in its construction. I was unwilling to incur much expense in a mere experiment. Now, however, I have no hesitation in saying, that a caoutchouc ball, if properly adapted to suitable machinery, will constitute an interesting and useful addition to our philosophical apparatus. Such an apparatus must not be viewed as a mere toy. It is, I believe, the only instance in which there has been a simple and inexpensive resinous electrical machine constructed. In the laboratory of the chemist such an instrument will not be without its use, and as illustrative of resinous electricity in the lecture-room surely it may be permitted to supersede a stick of red sealing-wax. I have not said so much as I intended, Sir, but I must not occupy more of your space at present. If what I have stated shall direct the attention of some of your readers to this portion of a most interesting and delightful science, no one will be more gratified than

Your ever faithful,

J. O. N. Rutter.

June 11, 1833.

WHITELAW'S IMPROVEMENT IN BARKER'S MILL.

Sir,—In reading over Mr. Scholefield's remarks on my improved form of Barker's mill, I perceive that his wrong ideas on the subject have arisen from his misunderstanding me. He thinks the mill is so constructed that the action of the water to turn it will be only on the concave surface of the outer curve of the arms. If I had intended *any* of the force of the water to be communicated to the mill in this way, I would not have taken *bf equal* to the distance that the extremity of the arms would pass over in the time that a particle of water moves from the centre of the mill to the extremity of the arms; I would have taken it *greater*. He is mistaken, too, when he thinks that there will be no force of reaction as the water leaves the mill, when the arms and jet-holes have equal areas; there would be none if the water left the arms in a radial direction: but if he had examined the cut in p. 76 of the Journal, (the same as shown in p. 353 of your Magazine, last volume,) he would have seen that the ends of the arms are so shaped as to make the water flow from them in the line of a tangent to the circle described by the jet-holes.

It was as early as the beginning of the year 1824 that I thought of giving the arms of Barker's mill the curve form. The Editor of the *Glasgow Mechanics' Magazine* takes notice of a communication of his correspondent, M. N., on the subject in the Number of that work for the 29th January, 1825: but a proper account of it was not published till I did it in the *Franklin Journal.* My reasons for drawing the mill with a tube-shaft, instead of having a packed joint close by the arms, are, 1st, that it makes a simpler and better understood drawing; 2d, in some cases the tube-shaft is the best way for leading the water into the arms; and, 3d, any person who knows any thing at all about the mill knows also about the packed joint, and could use it or not as he thought proper. I hope that the above, together with the fact that my account of the mill was published in the *Franklin Journal* before his account was given in your Magazine, will satisfy your correspondent, φ. μ.

I take this opportunity for correcting three errors of the press in my former communication on the subject. In the 17th line from the top of the 74th page of the *Franklin Journal*, for "*upper stone*" read "*aperture;*" and in the 39th line of the same page, "*a* to *h*," should read "*a* to 2;" then, two lines below this, for "4" read "3." These errors are continued in your Magazine; the first, in the 5th line from the bottom of the 354th page; the second, in the 16th line from the top of the same page; and the third, two lines below it.

As the Editor of the *Journal of the Franklin Institute* occasionally makes extracts from the *Mechanics' Magazine.* if he thinks proper he can copy my remarks on the observations made by Mr. Scholefield on my form of Barker's mill, into his Journal.

I am, Sir,

Your obedient servant,

JAMES WHITELAW.

Glasgow, June 15, 1833.

Instinctive Presentiment of Danger in Animals.—Before the shock of the earthquake was felt in Calabria, the fishes were observed to come to the surface; the birds screamed and dashed through the air; the horses, oxen, &c., testified their agitation by the glaring wildness of their eyes, by moans, and a tremble in every limb; and even the fur of the cats bristled up, and their backs rose. Almost as soon as these extraordinary phenomena were noted ensued the earthquake, which destroyed throughout Calabria 40,000 persons.—*The Voice of Humanity.*

The Nautical Almanac for 1834—the first which has been brought out under the direction of the present superintendent, Lieutenant Stratford—contains the following valuable improvements:—1. The moon's place is given for every hour of the day, while formerly it was limited to noon and midnight; 2. The places of the four bright planets, which were heretofore given for every seven days, are now given for every day; and 3. The lunar distances from the planets are now given, as well as those from the fixed stars. The price, at the same time, remains as before. The Almanacs for 1835 and 1836 are expected to be ready for the public before the conclusion of this year.

Safety Plan for Inclined Planes.—Sir, In a late No. of your Miscellany (which reaches the uttermost ends of the earth,) the following remark is made by Mr. Deakin, of Blaenavon Iron Works, in answer to a foreign correspondent:—"No one has yet found out any method to stop the carriages going down when the chains break. Any person that could invent something to do this effectually would not only be entitled to the thanks, but also to a handsome reward from all inclined-plane workers." Such desired plan of safety is now the invention of your present correspondent, and its success admits of immediate demonstration. Should your insertion of this meet the eye of any of the numerous proprietors of inclined planes, they may (should the object attained be of the importance spoken of) avail themselves, through your serviceable Journal, of a correspondence with the inventor, who would be happy to render a temporary personal superintendence in the application of his plan.—*G. H. S., Times' Office, June* 18, 1833.

Geometrical Progression.—Sir, will you allow me the privilege of requesting any of your numerous intelligent correspondents to have the kindness to inform me how the ratio of any geometrical progression is found, when the first term, the number of terms, and the sum of all the terms, are given, the last term not being given? This difficulty has suggested itself to me by a recent perusal of a question, respecting five unequal weights, at p. 151 of your first volume. Unit has given a solution to that question at p. 168 of the same volume, but has not, of course, said any thing respecting the method of finding the ratio. I have studied intensely the formula which Keith has given in his Arithmetic; but as the last term is not given, that certainly is not to me sufficient, which is attributable, doubtless, to the very little knowledge I have of Algebra. I can assure you, Sir, I have felt much reluctance in trespassing on your attention, but the manifest encouragement you have invariably given to persons who, like myself, have no means of procuring information but by their own perseverance, has tempted me to do so. I beg further to state, that I am one of the many to whom a perusal of your interesting Miscellany has been attended with much benefit, for it has certainly been the sole cause of exciting desires in my mind for my own improvement, which I trust will never be subdued. I am, Sir, your obedient servant, W. C. S.

[We recommend the subject of this lettter to the attention of our mathematical correspondents, from some of whom our praiseworthy correspondent will, no doubt, soon obtain the information he solicits.—ED. M. M.]

Recurring Decimals.—Sir, I beg through the medium of the Mechanics' Magazine, to inquire of your mathematical correspondents, whether any rule is known by which it is possible to solve the following and similar questions:—Given ·3488372+ a part of a recurring decimal series; required the series and its equivalent vulgar fraction. Conceiving that the method which I should resort to for procuring the answer to depend upon certain properties of recurring decimals, which are either not generally known, or hitherto unpublished, but which are entirely original on my part, the attention of your mathematical correspondents to the problem will be esteemed a favour. I will in a future communication transmit my solution, though I do not wish it to be published before I have the opinion of some of your readers on the subject. I am, Sir, your's, &c. ANTHONY PEACOCK, Gloucester Terrace, Mile End, May 22, 1833.

INTERIM NOTICES.

Answers to numerous inquiries in our next.

Y. Z. The letter of the 4th never reached us.

Bob Stay. We have written to the inventor for the necessary information.

W. J. C. is so complimentary that we regret much we cannot agree with him as to the propriety of reviving the discussion respecting the deficiencies in Newton's Appendix to Euclid.

Communications received from Junius Redivivus—S. D.—Friar Bacon—Humanitas—Mr. Arkwright—Nemo—Mr. Sanderson—A Jeweller—A Constant Reader.

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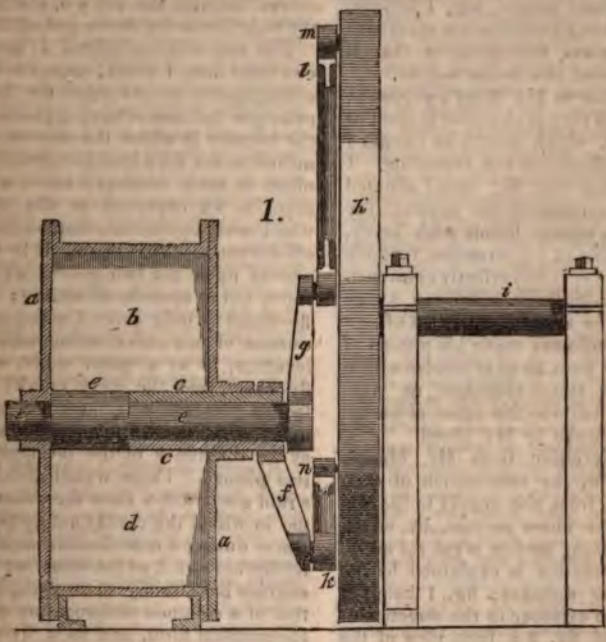
Mechanics' Magazine,

MUSEUM, REGISTER, JOURNAL, AND GAZETTE.

No. 516.] SATURDAY, JUNE 29, 1833. Price 6d.

GALLOWAY'S MODIFICATION OF MEAD'S STEAM-ENGINE.



GALLOWAY'S MODIFICATION OF MEAD'S ENGINE.

Sir,—Agreeably to my promise in my former letter, I now proceed to describe Mr. Galloway's modification of Mead's engine. Mr. Galloway intended the engine (which was begun, but, I believe, never completed,) for a blowing machine; but your readers will perceive that it might be applied as a steam engine.

One objection to Mr. Mead's engine is, that the steam ring or chamber is circular in its section, which would be attended with great difficulty in the execution. I should imagine that Mr. Mead adopted this form on account of the impossibility of packing a square piston with hemp, and, at the time of his invention, metallic packings were very imperfectly constructed; but as metallic packings can, at the present day, be applied to pistons of any figure, Mr. Galloway made his pistons of a rectangular form, so as to revolve within a cylindrical steam-chamber or ring, which is not liable to the same objection as the form chosen by Mr. Mead.

Another deviation from Mr. Mead's construction is, the substitution of connecting rods from the cranks to the fly-wheel, for the chase mortise, by which means the sliding motion is got rid of.

This construction is explained by the accompanying sketches; fig. 1 being a section of the cylinder in the direction of the axis, and fig. 2 a front view of the cranks and connecting rods, with a section of the cylinder across the axis, to show the steam passages and form of the pistons.

a is the steam cylinder; *b* a piston attached to the hollow shaft or axis *c*; *d* a piston attached to the shaft *e*, which passes through the shaft *c*; *f* a crank on the extremity of the shaft *c*; *g* a crank on the shaft *e*; *h* a fly-wheel upon a shaft *i*, which is placed eccentrically to the axis of the cylinder at a distance not quite equal to the length of the cranks *c* or *e*; these cranks are connected by the rods *k* and *l* to pins *m n*, in opposite points of the face of the fly-wheel; *o* is the steam passage, and *p* the eduction passage; but if it were required that the engine should have the means of working in either direction, a slide valve or four-way cock must be adapted to these passages, so as to reverse their functions; *r r r r* are pieces of wood, of a sectoral shape, attached one on each side of each of the pistons, but not touching the circumference of the cylinder, in order not to intercept the steam. The action of the pistons is similar to that in Mead's engine, the one piston traversing in the direction of the arrow, through the arc *o s p*, whilst the other moves through the arc *p o*, that is, from the eduction to the steam passage.

The two engines which I have thus described are, I think, superior in their arrangements to any other on the same principle (of two revolving pistons), and the manner in which the motion is transmitted to the fly-wheel is extremely ingenious in each instance; but I conceive there is an objection to the principle which would materially detract from their effectiveness. The steam, it is evident, presses upon the two pistons with equal force, but in opposite directions; and the fly-wheel is only carried round in consequence of one crank acting with greater leverage, or at a better angle, upon the fly-wheel, than the other crank; the effective pressure will, therefore, not be as the entire pressure upon one piston, but as the difference of the leverage of the two pistons. There would also be great strain and friction from the oblique manner in which the cranks act upon the fly-wheel during a considerable portion of its revolution; and, as the structure of these engines is certainly more complex than that of a common reciprocating engine of the simplest form, and as a fly-wheel is equally necessary in both kinds of engine to continue the rotary motion of the machinery at a certain point of the revolution, both kinds will occupy nearly the same space, I think that, upon the whole, these engines are inferior to those of the reciprocating class.

I remain, Sir,
Your most obedient,
J. Murdoch.

ON LIGHT.

Sir,—Your correspondent, G. L. S., has advanced some strange notions on the subject of light (M. M. June 16, 1832, p. 169.) He will find, on inquiry, that the satellites of Jupiter are eclipsed a quarter of an hour sooner when the sun is on the same side of the earth than when on the opposite side, and, consequently, that light takes just so long in passing over the earth's orbit, and half that time in passing from the sun to the earth. By

ıg that light, as an effect, can never G. L. S. seems to think he offers ing in contravention of the Newtheory; but one of the commonest ;ies of light is usually stated to be, is sent forth in all directions from visible point of luminous bodies. 'ever, G. L. S. would intimate that enters otherwise than by direct ission or refraction—in short, tl at s in a continuous form, as air does surface of the earth, and is no lependent for its production on the us body than on the body illumithe fact that light passes in rays may be easily intercepted by the sition of an opaque object, suffidisproves such an idea. Again, light is increased or diminished arious causes, and is capable of roduced by various means, G. L. S. that it cannot be an elementary le, nor constitute a part of either l or vegetable substances. But acts rather corroborate than overe theory of Newton and the hypof Dr. Brewster; for, if light be an t subject to reflection and refracis of necessity increased or dimiin many ways; and, certainly, the ng of light by artificial means out mon substances, is rather a proof is in those substances than other-Heat is absorbed by bodies; thereere is no departure from analogy posing that light may be in like concealed within them. G. L. S. at without light all vegetable subwould be white; but, whilst arn supp rt of this assertion, in the me sentence he in effect admits is by the continuous action of light ey become white. The fact is, light, substances would be black than white, for black has usually nsidered no colour, while white is to be an union of all colours: but, black, as some have recently supe a colour, the only way in which ld express the state of the subdeprived of light, in relation to our ould be to say that they would be y dark and invisible; for, whatever of colour or of power of vision, it e light and not in the substances. c Newton proved this in his expewith the prism. All substances texture *of surface suited to reflect*- *of that colour which they com*monly appear; but, if another colour only be made to fall upon them, they will appear of that colour.

G. L. S. next questions two of the simplest facts in the science of optics—that light is transmitted in rays, and that those rays may be collected in the focus of a lens. He says, that if light passed in rays, the Georgium Sidus would have the benefit of as great a degree of light as our earth, which is diametrically opposite to the truth; for, under the supposition, every planet has a degree of light in the inverse proportion of its distance from the sun, the radiating lines forming angles whose bases are proportional. The question he has raised about the converging power of a lens is inconsistent with his admission that light is refracted; but, as it is refracted, and as every substance has some refractory power, so any lens will as surely collect the rays to a focus. As to the form, G. L. S. ought to know that a glass which is plain on one side will collect the rays as well as a double convex one. G. L. S. very complacently asks his readers to imagine such effect to be produced only by the sun when vertical, or nearly so; but I apprehend the readers of the Mech. Mag. are not in the habit of taking such poetic flights, nor of swerving from the veritable truths of nature, for the sake of a passing compliment to imagination; and, indeed, if men will derive their theories from Akenside instead of from Newton, they must have some strange ones. The elements of the science of optics are as well ascertained as are those of any branch of knowledge.

The analisation of light was effected by Newton when he showed that it is not homogeneous, each separate coloured light having different powers of refraction, which conclusion, however, has been restricted by Dr. Brewster, who reduces the component parts of light to three, namely, red, blue, and yellow. G. L. S. argues, that flame is not capable of assuming light, because, setting aside reflection, if we turn our backs to ignited sulphur, &c., we cannot tell the colour of the inflammation. But this is only saying, that, if we turn our backs to the light and prevent all reflection of it to our eyes, we cannot tell the colour of it, or, in other words, if we shut ourselves out from the light and refuse to see it, we cannot tell the colour of it.

There are only two theories of light

heard of now a days—the theory of Newton and that of Euler. The question is, whether light, as it is seen in any ray, (for both parties acknowledge that light is transmitted in rays, and that it can be collected in the focus of a lens,) whether it is an element, or a series of undulations propagated in an universal ether. Modern mathematicians incline to the latter opinion; but to others it may not appear very philosophical to refuse to consider that to be an element which is apparent, and, in its place, to assume the existence of a substance which never can be made cognisable to the senses.

I am, Sir,
Your obedient servant,
S. D.

A MIDSUMMER NIGHT'S DREAM.

Sir,—During one of the warm evenings of the last week I was amusing myself by the perusal of Mr. Babbage's little work, the "Economy of Manufactures," and my attention was particularly directed to that part of the book in which the learned author describes his new method of delivering the twopenny-post, 3d edit. p. This fact may perhaps serve in some measure to account for the strange direction which my fancy took in the dream which ensued, which I purpose to detail to you, and for that end only I have referred to my previous reading. I insensibly fell into a light slumber, and found myself in an extensive library, in which sat an old gentleman, who appeared to have the custody of its treasures. I abstain from describing the appearance of the librarian, because I propose forwarding a description of his dress to the Editor of *La Beau Monde*. It is sufficient to say that his dress had no more similarity to the habiliments we wear than that both were coverings of the body. There was another point in which he differed from librarians of the present time, and that of much more importance. Seeing I was a stranger, he instantly quitted his seat; and, with much politeness, conducted me through the building, directing my attention to what he conceived would be interesting, and showing much anxiety to impart all the information in his power. I felt surprised that scarcely any of the books in the collection were known to me, and more so when I discovered that my questions appeared to the old gentleman so singular as almost to excite his laughter; and was only made aware of the cause when I sat down to the table where the new publications lay, and found that they were of the date of 2032, and mostly printed at Timbuctoo. I turned over many that treated of subjects not known to us, and which are full of signs and symbols I had never seen before; but at length, to my great gratification, the old gentleman laid before me a "History of the Steam-Engine," which he said was quite new. This was a bulky volume, in the Roman character and in the English language. The spelling was not precisely the same as now used, but the difference was not sufficient to render it unintelligible. I saw in the early part of the book many plates of the old engines (Savary's and others), at which I glanced hastily as I ran my hand down the chronology on the margin, anxious to come to the period at which I had left Mr. Babbage and the rest of the world, and about three parts through the book I at length found 1820-30. I read eagerly the pages which followed, and shall here attempt to set down, from recollection, their contents, premising that, as I do not profess to give the exact words, I shall not trouble the compositor with the peculiarities of the spelling or the arrangement of the illustrations.

Fragment of a History of the Steam-Engine, dated 2033.

* * * * * *

"We have shown that the steam-engine had been successfully applied to the moving of carriages upon railways, as well by stationary engines as by engines forming part of or attached to the carriages moved, which latter description were termed locomotive; but it appears that, about the year 1828, the common turnpike-roads of this country being in a state of great perfection, the idea was suggested of moving the locomotive railway-carriage, with some modifications, upon these roads, and this was effected in the same year by a Mr. Gurney (afterwards better known as the builder of the first bridge across the straits of Dover), as appears by the Parliamentary Papers referred to below, in which will be found an almost incredible account of the barbarism of some of our ancestors, who had the management of the turnpike-road between a place called Cheltenham (since decayed) and the city

loucester. We have succeeded in ning a print of the carriage, to which ivite the attention of the curious. It ten from a Journal called the Me-s' Magazine, now very scarce and us, and which moreover is one of the few works of this period relating to anics that have been preserved. Not-tanding the apparent success of Mr. ey's carriage in 1828, it seems that al years elapsed before it was much ed by engineers, who, when they at n directed their attention to the sub-confined their endeavours to the less- of the weight and bulk of the en-which they thought it essential should npany the carriage. These experi- continued nearly up to the year with no other result than some in-us variations of the form of the r, one of which (a boiler formed of a of tubes) was afterwards in general

The design of moving a carriage with e apparatus of an engine attached, boiler, cylinder, and chimney, (for was then used in its natural state, or latterly in the form of coke,) was all aid aside, when some one, whose has not descended to us, suggested the necessity of carrying all this it and incumbrance with every car- intended to be moved, might be ted by adopting what he called 'an ulator,' to be charged or wound a fixed engine, and capable of being d in and removed from the carriage easure. Before describing the rude vance which was thus introduced, which certainly was the foundation of onderful discoveries which have en- us to supply power for the use of hole world, we may remark that this ulator was but an application of a iple of which our ancestors of 1840 ong been in possession, very few of being without a watch containing ring so admirably controlled and ed for distributing or dispensing gh twenty-four hours the power ap- to it daily in as many seconds, that igh two centuries have since elapsed seful piece of mechanism has scarcely ed its form. The accumulator of speaking generally and avoiding s for the present, was nothing more the mainspring of a watch upon a scale, which was charged by a -engine built for the purpose, or by power. Steam-engines in use for purposes were sometimes used when equired for the purpose to which were destined. And we find also ome coach proprietors, having a lingering fondness for the labour of horses, employed them in a gin to charge their accumulators. Wind and water appear also to have been at first used in remote parts of the kingdom, where there was a want of machinery or a scarcity of fuel. However, between 1840 and 1850 very considerable progress was made in the application of the accumulator, for in a a book called 'Times,' preserved in the museum, and which was published in daily numbers, and was chiefly filled with announcements of the wants and wishes of our ancestors (many of which are very curious), there is an announcement by a coach-proprietor residing in London, informing the public that he had erected several steam-engines in a house he had designed for an hotel, for the purpose of supplying what he called 'portable power,' the price of which he gives. The Magazine before referred to, of the same date, has a long description of the establishment, from which it appears that an engine of 20 horse power was capable of charging in 15 minutes an accumulator which would propel a coach 10 miles in an hour, at the end of which distance another accumulator, either carried with the coach or taken up as was most convenient, was brought into action to continue the journey.

"In judging of this imperfect performance we must bear in mind, that at the period of which we speak the momentum acquired by the coach in descending such hills as remained (for the roads had been cut almost level to lessen the labour of horses,) was altogether wasted, the application of the lesser accumulator to the collecting and husbanding that momentum for use not being then discovered. And here we have again to regret that history has not honoured with a place in its pages the name of the ingenious person who, by connecting the moving wheel of the carriage with the lesser accumulator, attained at once all the advantages of the drag anciently used, and at the same time obtained, without expense, a power available to assist in moving the carriage from the momentum of which it had been produced. We shall hereafter describe the beautiful contrivance by which the two accumulators were so connected that when the larger was relieved from propelling the carriage (as in a descent) the lesser attached to the wheelwork, and commenced the duty for which it was designed.

"At this distance of time it appears strange that so many years should have been wasted in attempting to carry the steam engine in a carriage, intended to move with considerable rapidity upon an

imperfect surface. It would almost seem as if the engineers of the period had not clearly distinguished between the engine and its effect, or that looking upon it, with superstitious wonder, they had believed the actual presence of all its parts to be essential to the development of its power at all times and in all places. But it may, perhaps, be more charitable to consider this as another proof that the most obvious improvements may lie for many years within the grasp of man, and that, though the want of them be daily experienced, accident alone is the cause of their ultimate adoption.

"During the whole of the period 1840 to 1860 no attempt was made to introduce a better medium than the elasticity of metals for the construction of accumulators, and we do not find till the latter year that it had been observed that the compressible fluids now used were better adapted for receiving and distributing power. The first hint of such an application is contained in a book ——"

* * * * * *

At the moment I had commenced reading the sentence I have left unfinished, a crash like thunder aroused me from my slumber. I looked round, expecting to find that a whole shelf of books had fallen upon my venerable friend the librarian, but alas! had the mortification to find that my dream had been broken by Shillibeer's last omnibus. I did not "cry to sleep again," but resolved to read Babbage every night till I have another dream.

G. W.

CONDENSATION OF GASES.

Sir,—There exists a prejudice to place too great a value on refinements in the investigation of things, and to prefer an explanation because it reaches to causes that are recondite and obscure, rather than one which only uncovers those that lie just under the surface, whereby valuable truths are often overlooked. Thus three of your correspondents ascribe the re-issue of gas, after a short interval, from the vessel in which it had been condensed, to a resumption of the caloric which it had lost during the expansion. Not to insist on such resumption being simultaneous with the expansion, I would remark on the small increase of volume which would result from this cause. Besides, your correspondents have forgotten what I asserted from my own experiment, that a re-issue takes place when a *liquid* is used. One of them thinks (p. 12) that the little elasticity of the metal forming the vessel is adverse to the ground on which I founded an explanation of the appearance, namely, the circumstance of the vessel slowly resuming its original form. Now, on the slightest reconsideration he must admit that it is exactly in consequence of the imperfect elasticity of the metal that this circumstance takes place, for otherwise the contraction would be simultaneous with the first issue of the gas or liquid. He will not say that the metal is so devoid of elasticity as to make no effort to recover its original position, for a vessel of such metal would withstand no internal force.

I am, Sir,
Your obedient servant,
BENJAMIN CHEVERTON.

THE UNDULATING RAILWAY.

Sir,—I think theory is in favour of Mr. Badnall's undulating railway, and am of opinion that the *reserved locomotive power accumulated in the machine, which would have been expended* in giving velocity on the level (besides overcoming mere friction), may be mathematically proved to be, *under certain circumstances*, more than sufficient to elevate the carriage that portion of the incline or ascent which the accelerated motion of descent leaves undone.

The theory may be stated thus:—The machine would perform the full curve, by the power of gravitating accelerated motion, if unobstructed by friction and resistance of the air. Now, if it carries within itself *a separate power more than sufficient* to counteract these obstructions, that surplus power will necessarily extend its arc or line of motion. From a boy I have been able to swing in a common rope swing without help or touching the ground, and to *enlarge the arc of my vibration* at pleasure, and continue it as long as I please, solely by means of the locomotive power contained in myself. This may be a common boy's practice in London, for aught I know, but few or none of my companions in the country could do it.

Your's, SAXULA.

June 17, 1833.

PETERBOROUGH COURT CONVERSAZIONE.

[It is known to most of our town readers that we hold a *Conversazione*, as it is called, at our Editorial chambers on the last Wednesday of every month, at which we are always happy to see such of our readers and correspondents as may be desirous of spending an evening in agreeable conversation with men of congenial minds and pursuits. The matters treated of at these social meetings have occasionally been of considerable importance, and observations and facts have been elicited in the course of them which deserved a better fate than to be heard and forgotten. The frequenters of the Royal, the London, and other Institutions, may, judging from their particular experience, smile incredulously at this; but we pledge our veracity for the fact. Well—it has more than once been suggested to us, that were we to publish each month a brief minute of the sayings and doings at these meetings, we should not only enrich, but greatly enliven the generally grave character of our pages; and be only doing, besides, what is right by our country friends, who have but rarely an opportunity of honouring and gratifying us with their personal presence. We have at length made up our minds to act on the suggestion; and have retained, at a large salary, that most expert of stenographists, Mr. Harding, to set down, without note, comment, or embellishment, every thing that is said or sung on these occasions. Having now, then, introduced Mr. Reporter to the notice of our readers, we shall make our bow and retire.—Ed. M. M.]

PETERBOROUGH COURT CONVERSAZIONE, JUNE 26, 1833.

First of the Summer Quarter.

Present—The Editor—Sir Dionysius Dawplucker—Major Barbette—Mr. Jonathan Testall, A.M.—Counsellor Tout-Voix—Dr. Tangent—Professor Crackwell—Mr. Cyrus Crucible—Mr. Septimus Speed, C.E., &c. &c. &c.

Sir Dionysius.

Any thing new, Mr. Editor?

Editor.

Yes, something quite new—

> "There's a chiel amang us takin notes,
> And faith he'll prent them."

Sir Di.

Well, I am glad of it. I never say any thing which I would not repeat before all the world. But new in science I mean?

Editor.

The newest thing I have met with for a long time past, is an assertion of your favorite, Goethe's, that all our new things are old as the hills.

Tout-Voix.

Yes, I see Muller records of him that he thought the moderns had done little or nothing in the way of scientific discovery.

Editor.

His words are, "Were the old English Friar Bacon, after the lapse of so many centuries, to rise from the dead, walk into my study, and courteously ask me to make him *acquainted with the discoveries which have been made in art and science* since his time, I should feel somewhat ashamed. I should not very well know what to answer the good old man."

Barbette.

Ashamed, egad! So he well might be—not, however, for modern times, but for his own deplorable ignorance.

Editor.

Deplorable, indeed! For all that "the good old man" knew, or that was known by any body, in his day, was really but as a drop in the ocean compared with the discoveries of later times.

Tangent.

It might have sufficed, methinks, for answer to the ghostly friar, that since he flourished in the world, there had arisen a Newton.

Barbette.

Or a Franklin.

Testall.

Or a Cavendish.

Crucible.

Or a Priestley.

Testall.

Or a Davy.

Speed.

Or a Watt.

Editor.

Aye, or any one of fifty other illustrious names that might be mentioned.

Tangent.

And every one of them identified with some memorable discovery, which of itself throws all former discoveries into the shade.

Crackwell.

Some *red-letter day* in science, as my ingenious friend, Brande, has happily expressed it.

Tangent.

Newton's theory of attraction, for example, which first unveiled to us the whole system of the universe!

Editor.

Or his decomposition of light, a thing which no man before ever dreamt of bringing within our corporeal grasp.

Barbette.

Or Franklin's discovery of electricity, which subjected "heaven's own thunder" to our control.

Testall.

Or Cavendish's resolution of water into its primary elements.

Crucible.

Or Priestley's discovery of the vital principle of the atmosphere.

Testall.

Or Davy's discovery of the composition of the earths, that is to say, of the elementary constitution of this great globe itself!

Speed.

Or Watt's conversion of fire and water into that stupendous instrument of power the steam-engine.

Editor.

In short, gentlemen, it should seem we may safely affirm, that since the old Friar's time we have mastered, one after another, every element of nature—earth, air, water, and fire.

Crackwell.

And established for the first time, in all its glorious fullness, as my estimable but dreaming friend Coleridge would say, the dominion of mind over matter.

Barbette.

Why, Sir Di, your friend Goethe, must have been a prodigious ignoramus to know nothing of all this.

Sir Di.

I don't know that, for I think he added, that he had discovered in the works of Friar Bacon traces of many of those things on which the moderns pride themselves most highly.

Testall.

Obscure traces of one or two, perhaps, such as the solar microscope and camera obscura; but of none of those grander discoveries which you have just heard enumerated.

Editor.

Come, Sir Di, you must confess your great German could have known nothing of what he was talking about.

Sir Di.

So it would seem; and yet I can hardly imagine how a person of Goethe's extensive literary attainments, and who was for a long time at the head of the first literary circle in Germany, could have passed so many years in the world without becoming acquainted, in some degree or other, with the important discoveries that have been mentioned.

Barbette.

The thing is not at all surprising. Goethe was a poet, romancer, moralist—metaphysician, if you will—but nothing more; a man of prodigious imagination, but small learning. He did dabble a little in the physical sciences, but not till he was far advanced in years, and with a success which shows he was no exception to the adage, that there is a period of life when people get too old to learn any thing.

Speed.

He was besides, I have heard, a very vain man, and it is a foible of vain men, when they attain to eminence in any particular line, to look with supreme disdain on every other.

Testall.

The best proof of which vanity, is that he should ever have imagined such a thing as the Friar's rising from the dead to apply to *him*—of all men in the world—to know what had been doing in art and science. His ghostship, I opine, would have known better.

Tout-Voix.

But it seems strange he should never have heard, from some of the many learned men around him, of the wonderful progress which the physical sciences had made in modern times.

Barbette.

Not at all strange, for Goethe never mixed much with such men; his delight was to be the idol of a courtly circle, where all the talk was of the Devil and Dr. Faustus.

Testall.

And had he even condescended to seek for information from the learned book-worms the Counsellor speaks of, I am not sure that he would have found any of them much wiser than himself; for Germany is still sadly behind in all that

regards the physical sciences, with the exception perhaps of botany and mineralogy.

Tangent.

What, the country of Leibnitz and Encke!

Testall.

Yes, Leibnitz and Encke, notwithstanding. I speak of Germany in the general—its people and its scholars in the general—they are still far behind those of England and France in scientific knowledge. If you want to judge of the state of science among the Germans, you must not cite such rare and "far-between" instances as Leibnitz and Encke, but take some one of their every-day men of learning—some one who passes for an authority among his fellows, and for a conjuror with the mob—and see how *he* will discourse to you about scientific matters. A Wilhelm Vön Turk, for example.

Barbette.

Ah! the same Vön Turk, whose "Phenomena of Nature" was so unmercifully cut up in a certain periodical, which shall be nameless, a year or two ago?

Testall.

Yes, the same, whose work I should say is a fair specimen of the average proficiency of the Germans in scientific knowledge; and that work, as we all know, abounds in instances of the grossest ignorance of the phenomena it pretends to explain. It is precisely such a work as I think Goethe, with his half knowledge, would have written on the same subject — I mean, as regards the matter of accuracy.

Editor.

But you forget, Testall, what, in justice to the Germans, ought never to be forgotten, that this same work, which you pronounce to be so worthless, was thought so well of by our own illustrious "Society for the Diffusion of Useful Knowledge—"

Barbette.

Illustrious humbug!

Editor.

Well, humbug or no humbug, a Society composed of some of the most learned and eminent men of England of the present day—it was thought so well of, I say, by them, that, in their *Journal of Education*, they earnestly recommended that it should be translated for the benefit of the youth of our own country.

Crucible.

A recommendation which they shortly after retracted.

Testall.

But not, till after the faulty character of the work was so ably exposed in the Mechanics' Magazine.

Crackwell.

And till after my spirited and worthy friend, Mr. Effingham Wilson, had been betrayed by the Society's recommendation into the serious mistake of publishing an English translation of the work for the benefit of the trunkmakers and confectioners.

Sir Di.

Well, but if the Society thought at first so favourably of the work, does not this show that, after all, the average state of science in England cannot be much higher than it is in Germany?

Barbette.

Yes, it would show that, if you could prove that the eminent men who compose the Society had, collectively, any hand in the publications sent forth under its "superintendence;" but every body knows that superintendence is merely nominal.

Testall.

The fact speaks for itself. Nobody can suppose, for one moment, that so contemptible a production as Vön Turk's could have the approbation of such men as Sir Charles Bell, or Captain Beaufort, or Mr. Jardine, or Dr. Roget. And this is but one of many facts of the same kind which prove incontestably that the "superintendence" of the Society is all fudge.

Tangent.

Then, in my mind, gentlemen, there never was a more discreditable imposition practised on any community than this of a body of men lending the weight of their names to help into circulation productions of the merits of which they know nothing.

Testall.

I think less of their lending their names—for people may and do frequently lend their names to institutions on the ground merely of general tendency—than of their sanctioning the pretext of "superintendence;" because superintendence conveys a distinct intimation to the world that there has been an actual exercise of judgment and discrimination on the part of the persons whose names are put forward, and it now appears there is nothing of the kind.

Barbette.

Nothing whatever; it is as false a pretext as ever was made use of to cheat honest men out of their money.

Crackwell.

Don't you think, Counsellor, they might be indicted? I am sure there could be no want of plaintiffs; for, of the many thousands of the Society's publications which have been circulated, at least nine in ten must have been bought on the credit of the word "superintendence," and nothing else.

Tangent.

Aye, there's the rub! For if the works published in the Society's name had been really worthy of it, no one would have cared to inquire whether the superintendence was real or not. But the great majority of them are sad trash.

Sir Di.

Got up for sale merely, without the slightest regard to the value of their contents.

Crackwell.

Or concern, I fear, for the reputation of the Society.

Barbette.

The clique who have the jobbing of the Society seem to have thought only of running a catchpenny race against the cheap publishers.

Crackwell.

And have not caught the penny after all, it seems; for, strange to say, notwithstanding the extensive sale which most of the Society's publications have had, there has been, I understand, a loss, upon the whole, of many hundred pounds.

Crucible.

Incredible!

Testall.

Impossible!

Crackwell.

So at least the Society's official reports inform us.

Barbette.

Yes; but after the clever dissection they received in the *Athenæum*, who believes them?

Sir Di.

Not I.

Testall.

Nor I.

Crucible.

Nor I.

Barbette.

Nor any man who can put two and two together.

Tangent.

'Tis a great pity the Society should have been so lamentably mismanaged; for most of its members, I am sure, meant well, and there are many things which such a Society could accomplish for the literature of a country which it is beyond the power of individuals to accomplish.

Editor.

As for example?

Tangent.

Such an Universal Dictionary of Language as your friend, Junius Redivivus, suggests in the *Monthly Repository* of last month.

Tout-Voix.

The *Monthly Repository*; what publication is that pray? Never heard of it before.

Tangent.

No! Why, then, Counsellor, send for it the moment you get home, and if you do not confess the next time we meet that you have been in the habit of missing one of the richest monthly treats which are served up to the reading public, I shall be greatly surprised.

Crackwell.

It is a sort of Unitarian Journal, is it not?

Tangent.

It is edited by an Unitarian, and published by an Unitarian, and supported, very likely, by Unitarians; but what the religious opinions of the writers are could not be known from the Journal itself, which, ever since I knew it, has been of a purely literary and political cast.

Editor.

'Tis an excellent periodical, undoubtedly—distinguished beyond most of its contemporaries for original and vigorous writing, sound and enlarged views of men and things, and noble and generous sentiments.

Barbette.

But what of the Universal Dictionary of Language suggested by Junius?

Tangent.

Why, Junius is of opinion that one of the chief wants of literature is a history of words from the time that written language was first used, and that such a history would be a history of the world, and the only true history within our reach. But I must give you his own words.

There, Counsellor, (handing the *Repository* to Mr. Tout-Voix,) you are a good reader—for a counsellor and considering, as they say—begin there and read on.

Tout-Voix reads.

"Sir Robert Walpole was accustomed to consider history as a romance; and he was perhaps not very far from the truth, as history has hitherto been written, but the history of words must be a true history, for names would never have been given to things, unless the things had previously existed; names would as little have been given to the qualities of the human mind, unless those qualities had existed and had been discovered. The history of language is the history of moral and physical science; it is the history of every source of consciousness, of all that we know, of all upon which we can communicate our thoughts to each other. By the analysis of language we can ascertain the probability of facts, as well as their possibility; we can detect interpolations in history, as the forgery of a document was proved by the posterior date in the wire mark of the paper. We can get absolutely at the moral and physical condition of any human beings, at any given period, by studying the language they used at that period."

Tangent.

Now pass on to what he says about the want of this sort of history, and the means of supplying it.

Tout-Voix, in continuation, reads.

"We still need to trace back the track by which human beings have gained their present elevation. We have still to learn their actual progress; and it is only by becoming acquainted with the history of all languages that we can get at facts, stripped of prejudice. It is time that the work was commenced upon a systematic method. It is time to remove the disgrace from "merry England," that, with all her immense resources, she has yet done less *public* service to the advancement of human knowledge than an obscure German Court. Existing means are, in abundance, misapplied and devoted to unworthy purposes; but even if they did not exist, they should be produced by the sacrifice of less useful things. The property which is wasted in one year by the corporations of a single city in feasting only, might serve for the endowment of a college of universal language, in which the professors of all languages might meet together and work in concert, beginning at the beginning. No single man can acquire a knowledge of all languages; and even if he could, the very fact would possibly be a proof of deficiency of reasoning powers * * But *professors who study a single language* usually apply themselves to it from liking, and are acquainted with all the minutiæ. They work *con amore*. In addition to one or two professors of each language, there should be several men of sound judgment, in the quality of supervisors and comparers, who would not be swayed by the enthusiasm which has carried many etymologists away from the truth in their exclusive admiration for their favourite language. With such an arrangement of labourers and directors, classification and beneficial result would be certain * * It is clear that such a work would be the history of the world, and an unerring comparison of the progress of all nations. It would be a most glorious thing for a nation to pride itself upon."

Tangent.

Now that is what I call a truly noble project, and one which it would have exactly suited such an association as the Useful Knowledge Society to undertake.

Editor.

And done them immortal honour to execute well.

Speed.

Who knows but what they may yet be induced to take it in hand? While there is life there is hope.

Barbette.

Not much hope of any thing so good from such a quarter. I should look for grapes from thistles as soon.

Sir Di.

It is not very likely that a body, whose past proceedings have been all conceived in so paltry and mercenary a spirit, should ever take cordially to a design of so lofty and philosophical a character as this.

Tangent.

I wonder my old college chum, Henry Brougham—we studied under Playfair together—should allow his name and authority to be prostituted to such base ends. His was a noble spirit once.

Barbette.

Aye, that was, Doctor, when he was but plain Henry Brougham; but now he is Baron Brougham and Vaux, Lord High Chancellor of all England.

Sir Di.

And oh! how changed!

Testwell.

How fallen!

Crackwell.

'Twas when he stood for Yorkshire, I think, he declared he should desire no prouder epitaph for his tombstone than

the words—"The Friend of the Education of the People."

Barbette.

And yet, when raised on the shoulders of the commons of Yorkshire to the woolsack, we have seen him protesting that he thinks a national system for the education of the people altogether unnecessary!

Crackwell.

'Twas about the same time, too, I think, he observed, at a meeting of the promoters of the London University, when speaking of the necessity of its obtaining a charter — "*Public opinion will wrest such an instrument from the hands of the most corrupt government in the world.*"

Barbette.

And yet, now that he is himself a principal member of the government, he sees that University languishing—going to ruin—for want chiefly of that charter, which, if he were a man of stedfast purpose, would be granted at his bidding! Is not this being something even worse than "most corrupt?"

Tout-Voix.

You are very harsh, gentlemen, on his Lordship. You know not what obstacles he may have had to encounter.

Barbette.

Obstacles! No obstacles should stand in a man's way when his honour and consistency are at stake. He should have sacrificed office—every thing—rather than his character.

Tout-Voix.

You judge of the Chancellor as if he had nothing else to do, as minister, but to promote the cause of education; but you forget the number of other important measures, the carrying of which depends on his remaining in office. Look at his Local Courts Bill, for instance.

Barbette.

Oh! that only shows his inconsistency the more. The best promoter of justice among men is knowledge; and a School in every parish would have been worth a Court of Law at every door.

Sir Di.

Well said, Barbette! The schoolmaster against Westminster Hall, for ten thousand.

Editor.

And the taxes on knowledge.

Barbette.

Aye, worse and worse. Courts are to be established, at a vast expense, to enforce the laws; and the press, which is the only means by which the people can be taught what those laws are, and what the moral foundations of them, is to continue fettered by restrictions and imposts! Was there ever inconsistency so monstrous?

Tout-Voix.

Well! I must say I little expected to hear such opinions of his Lordship expressed in a company of scientific men like this. To *them*, at all events, Lord Brougham has ever been a kind and constant friend.

Omnes.

How? How? How?

Tout-Voix.

Why, there are instances innumerable. There is Drummond, for instance—I suppose you all know it was through Brougham he obtained his post in the Treasury.

Barbette.

A fine post, truly, for a man of science —letter-writer and folder to a Minister! I wonder who is most obliged—the Secretary who is condemned to such drudgery, or the Minister who has a man of such talent for his Secretary.

Tangent.

If a profound knowledge of mathematics can qualify a person to be a good Secretary, Lord Althorp may consider himself well provided.

Crucible.

I don't imagine his mathematics had any thing to do with his appointment.

Crackwell.

No; I am rather inclined to think he must have been selected on account of the *new light* which he invented.

Barbette.

Not that either, Professor; for wherefore should men seek light who delight in darkness?

Testall.

But is Drummond your only instance, Counsellor?

Tout-Voix.

Oh! there are many others. Look at the honours he has caused to be conferred on men of science—on Leslie, and Brewster, and Bell, and Ivory, and South, and Herschell, and I don't know how many more.

Barbette.

Aye, so many, that his Majesty is said to have observed, "Why, Brougham, I

think I had better knight the whole of the Royal Society at once."

Tangent.

The man to be envied is he who has escaped the infliction. Your plain *Mister* is now the title for choice.

Testall.

And, after all, what's in a name? What have all the empty honours you speak of done for science? A slice of solid pudding were worth them all.

Barbette.

Just now, especially, friend Testall. I don't like giving hints, good Mr. Editor; but much talking maketh even a wise man husky.

Editor.

No apologies, Major; supper is at hand. All who are of opinion that we should forthwith adjourn will say aye.

Omnes.

Aye! Aye! Aye!

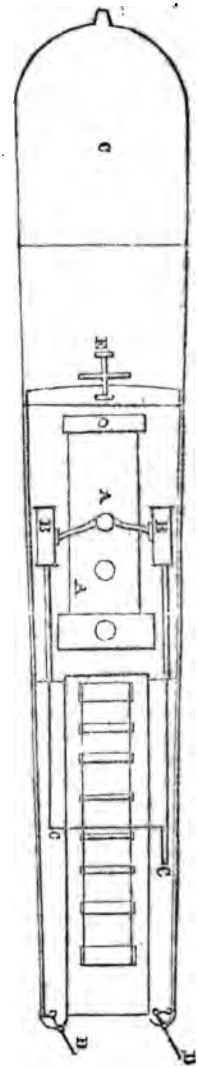
(Exeunt omnes.)

STEAM-BOAT WITH PADDLES IN THE STERN.

Sir,—There is a small steam-boat now fitting up in this port, which is intended to be sent to Ostend, and thence to Bruges, for the use of our Belgian neighbours; and as it is entirely different in construction from any I have yet seen, perhaps you will be kind enough to insert the following description of it in your useful Magazine.

Your obedient servant, J. F. B.

Liverpool, June 4, 1838.



A A is the boiler, on Messrs. Stephensons' principle, with tubes running through the length of it; it is a high-pressure one, and of precisely the same construction as those of the railway locomotives.

B B Two 10 horse cylinders, working by means of cranks.

C C The paddle wheel, placed in the stern of the vessel.

The vessel is made of iron, except the upper works above water-mark; is 76 feet long, 14 feet 10 inches broad, and draws about 2 feet 4 inches water. She is steered by two rudders, D D, on each side of the cavity for the reception of the paddle wheel, and the steering wheel is at E, in the centre of the vessel, before the engine-house.

F Cabin, fitted with small tables and seats round them, like a coffee-house.

G Forecastle, &c. &c.*

* In a late trial she went 7 miles in 33 minutes, tide in favour. The *steam was not up at its full height, nor were the paddle-boards deep enough.*

THE ALCHEMISTS, PERPETUAL-MOTION SEEKERS, AND AERONAUTS.

Sir,—In the course of looking over some of the late numbers of the Mech. Mag. I was struck with the similitude which exists between the labours of the *ci-devant* alchemists and those of a portion of your correspondents yclept perpetual-motion seekers, who employ their own time and your pages in giving publicity to their visionary lucubrations

Amongst others I observe one plan, in which its author endeavours to prove, contrary to all the laws of nature, that water can by its own power not only set in motion three pumps and as many wheels, but also raise itself to a considerable height above its level! Another of your correspondents supposes three weights at one side of a wheel to continue raising five weights at the other, not perceiving that what power is gained by length of lever on the one side is lost by the greater number of weights on the other. And a third advances what is certainly rather an original idea, namely, that friction is an advantage to machinery, instead of the contrary, as has generally been supposed.

The diligence of the "self-moving machinery seekers," in searching out facts, is certainly highly commendable, and may lead to useful discoveries; but why do they not keep their theories to themselves until they find out something likely to be of advantage to the world? For, notwithstanding the impossibility of producing a piece of mechanism which will generate its own power, many useful facts may be elicited by the seekers, which would otherwise perhaps never have been brought to light. No scientific pursuit should be discouraged on account of the real or apparent impossibility of its succeeding. Had it not been for the labours of the alchemists of former days, chemistry would probably never have attained its present eminence as a science. They found not what they wished, but discovered many other and more valuable secrets than that they sought; and, even in our own days, we continually see the advantages resulting from perseverance, in spite of all difficulties. Had the first projectors of steamboats listened to the outcry that was raised against the possibility of steam being used for the propulsion of vessels, we should now, as formerly, be dependant on the winds and tides, instead of being able to make our way in defiance of them.*

Having said this much against the doctrine of self-moving machinery, allow me to suggest to your readers a few queries, which many of them probably will consider more difficult of solution than the great question itself, but which *may*, in my humble opinion, in the course of time be discovered.

By way of introduction, however, I may remark, that discoveries and inventions have within the last few years been proceeding at so rapid a pace that it is impossible to fix any limit to their increase. The art of rising in the air by means of balloons is now well known: many attempts have been made to guide them, but, by reason of their bulk and unwieldiness, all have failed. By calculation it has been found that the strength of a man, exerted during ten hours a day, would be sufficient, with the assistance of wings, to sustain him in the air only five minutes, which shows that the power required to support him is just 120 times what he possesses. This power must be gained by machinery: this, then, is required:—

I. A steam-engine of such power and so light a construction that it will be able to move a pair of wings large enough to raise not only itself, but one or two men in the air.

II. The cheapest and most efficacious manner of decomposing water and collecting the hydrogen gas in such quantities as may be sufficient for the purposes of fuel.

I am, Sir,
Yours, &c.,
BERGEIN.

Mysore, November 5, 1832.

* We beg to interpose a word or two in behalf of our perpetual-motion friends, or rather in vindication of ourselves for giving publicity to so many of their speculations. "Bergein" asks, "Why do they not keep their theories to themselves until they find something likely to be of advantage to the world?" To this we think we may safely *answer, so they do; they never* do publish until *they imagine they have found* out "*something likely to be of advantage to the world.*" Besides, if they were restrained from publishing, how should we get at those "many useful facts," which "Bergein" admits may be elicited in the course of even the wildest projects of this description. If the alchemists had never published till they found out the philosopher's stone, or *elixir vitæ*, where would have been the benefits which chemistry has derived from their researches? There is another important point of view in which the matter deserves to be looked at, and that is, the good of the perpetual-motion seekers themselves. They are still, notwithstanding the wide diffusion of scientific knowledge in modern times, a very numerous race: almost every village can boast of some lone enthusiast of this description. Now, as there is a common fallacy which pervades all schemes for effecting a perpetual motion, the chances are that by subjecting any one of the number to the test of a public examination, and thereby ensuring its refutation, you will demolish hundreds of others, and while thus exposing the folly of one visionary may be the means of curing many. We know, indeed, that, in point of fact, our Journal has in this way done much good.—ED. M. M.

CHECKS TO POPULATION HELPS (NOT CHECKS) TO VIRTUE, KNOWLEDGE, AND HAPPINESS.

Sir,—Controversies seem to thicken upon me, and my leisure has not served me so well as I could wish to make up my arrears. But I now proceed to reply to the letter of "R." in your Journal of the 27th of April last, on the subject of population, a question of more importance to the community than all the political squabbles that were ever concocted—and I proceed to it with a hoping heart, inasmuch as I deal with no prejudiced opponent, but with one anxious to come to the same conclusion as myself,—the happiness of the human race, and the extension of the human race over the earth's surface in as large numbers as may be compatible with that happiness, *leaving none unborn to whom existence might be a source of more pleasure than pain, and producing none to whom existence were likely to be a source of more pain than pleasure*,—a position which I believe to be based on sound philosophy and benevolence.

I by no means dispute the assertion of "R.," that a larger number of human beings might be comfortably maintained on the soil of Great Britain than at present exist, though, if he be correct in his data—1$\frac{3}{4}$ of an acre to each individual—one might think it quite crowded enough, without bringing the proportion down to $\frac{3}{4}$ of an acre each, which he assumes to be sufficient. It is quite certain that when people thicken too much on one another they are apt to quarrel; and this is a point on which, I must confess, I feel rather sensitive, having more than once sailed in crowded vessels, and witnessed the disputes arising in them. Sufficient elbow-room I hold to be a great promoter of good fellowship, though I do not quite agree with the Backwoodsman, who declared that he could no longer breathe in freedom, and should instantly remove, as he was so "crowded" that he could not travel more than nine miles out of his door in one particular direction without lighting upon a neighbour. But supposing us not to be yet sufficiently crowded in England, still "R." must agree with me that it will be wise to make the increase of food precede the increase of people. Granted, that there may be *abundant means of increasing the supply of food*, still there exist in one shape or another obstacles to the use of those means, whether by corn laws, or general ignorance as opposed to individual knowledge, or the fact of waste lands, as parks and commons and other large tracts, being in the possession of those who are unwilling to suffer them to go into tillage, or want of capital amongst labourers, &c. In alluding to tillage, I do it upon the supposition that tilled land produces more food than grass land; for it must be remembered that parks and commons always serve to produce some kind of food by grazing, whether it be deer or geese, black cattle or sheep. "Labour and material" are, undoubtedly, the elements of wealth, but so long as obstacles exist to prevent their conjunction they will not fructify. Now, whether the obstacles be ignorance or misgovernment, it is necessary to remove the obstacles before the wealth can exist. "R." will not deny that numbers of people are in misery for want of food—but food he asserts might be increased in quantity Is there any cause to prevent the increase save ignorance and misgovernment? If he agrees to this, is it not as clear as any demonstration in Euclid, that, so long as those obstacles shall exist, the bar to the comfort of the people is as effective as though there were no possibility of increasing the food—as though we had already got to the maximum of production? Under such circumstances, then, is it not the part of wisdom to limit the number of mouths to the actually existing supply of food? And is it not the act of ignorance or wickedness, under such circumstances, to go on with an unlimited increase of mouths? Education and the improvement of government, it must be remembered, are slow processes. It is only progressively that we can advance: we cannot step out of poverty into affluence, or bring forth a sudden supply of food, as the rod of Moses brought forth the stream from the rock: care and calculation are necessary; and those who cultivate the earth are not, as a mass, the most enlightened men of the community. They cannot theorise justly, and ensure the result of an experiment. They first doubt, and then creep, and after much time began to move faster. Mr. Mac Evoy, the gardener in Miss Edgeworth's tale, looked with distrust upon Forester, when he proposed an experiment on the

cherry-tree, in order to make it produce a double crop. Mr. Mac Evoy was a "practical" man, and so are the majority of food producers. "R." says that "storehouses are crammed with grain and other provisions." True: but this is a very vague assertion to found an inference on. It must be shown that these provisions are wasted, before we can take it as a proof that the provisions are in surplus. Most granaries are filled in the season of harvest; but if their contents were all consumed in the first half-year, what would become of those dependent on them in the next half-year? Monopolists do not usually store up provisions to throw them away: they want them for the market, and they are not likely to encumber themselves with more than the market requires, but on the contrary with less, as their profit thereby becomes larger. "R." seems angry with the "monopolists for hoarding their food in time of scarcity." Does he not see that in such cases the self-interest of the monopolist operates upon the community, precisely as frugality in a household makes a scanty supply of provisions hold out? When corn is high-priced, people consume less of it, and the high price is a proof that there is less to consume. What would be the consequence, if, in a season of scarcity, people were to consume their full rations? What would be the consequence in a ship if the crew were to consume their full allowance of water when, with twenty days' stock, they had sixty days' navigation before them? "R." complains, that "100,000*l.* worth of beef, pork, butter, &c. were shipped from Ireland to the English markets, and that potatoes were sent over to keep their producers from starving." Suppose the beef and pork and butter had not been sent, what then? It is clear that Ireland would have been so much better off, and of course England must have been so much worse off. There was too little for all, and somebody must needs suffer. Why put Ireland in such invidious opposition to England? Are they not both parts of the same empire, and is not misery misery whichever may suffer it? To take from one to give to another will not improve the matter: it would be better to remedy it by producing food enough for all, or, in default of that, by limiting the *mouths to the existing food.* The *common argument that* England robs Ireland of her food is very hackneyed, but it is founded on error. English labourers do not go to Ireland, but whole shoals of Irish labourers come to England. What does the "beef, pork, butter, &c." come for, save to help to feed them? Give back to Ireland all her food, and all her labourers, and where then would the balance be? Can there be a doubt that the condition of the English labourer would be improved? Much talk has been raised about the absentees, asserting that they drain Ireland of her wealth to enrich England; but it is a fallacy. It is clear that all they take from Ireland must be in Irish produce, or in Irish manufactures. But then how stands the account of clothing, &c., which England supplies to Ireland? It is much to be wished that the custom-house documents were made available to furnish the public with a correct statement on this head. It must be clear to all, that if England have a balance in her favour on the general transaction, the amount must be the absentee fund; and then, as a set-off, England has to maintain a large amount of Irish emigrants.

"R." would seem to be in some error in his calculations. He says in one place, "by the census of 1831 we have an acre and three quarters to each individual." In the next paragraph he says, "We have in reality 3 acres, 3 roods, and 18 poles to each individual."

"R." says, "feed the people first, otherwise they never can be educated." I agree with him, "that it is absurd to attempt to educate a starving man;" but it by no means follows that education and providing food may not go on together. But there is a fallacy here. "R.'s" premises assume that *all* the people are starving. This is not the case. It is but a small portion of supernumeraries who are starving—a numerous body it is true, but not numerous when compared with the mass of the nation. Now, though it would not be possible to educate these starving people before they were provided with sufficient food, it would be perfectly possible to educate the large mass who were not starving, to show them the causes which had reduced their companions to a state of misery, and thus, at the same time that they themselves were forewarned, their education would enable them to exercise

estraint over such of their asso- l fel'ows as might not be so ucted as themselves. The in- the example of equals is much ally powerful over mankind recepts of superiors, even when r legal sanctions. And surely rality imperiously demands that ings should not multiply their hile there is a probability that ring may be exposed to the hunger. "R." certainly mis- if he imagines me to object to or small farmers cultivating do not. I only object to the f numbers beyond the supply whether that supply be limited , or by the mischievous regula- nan. In the latter case I wish tions to be removed before the mouths is increased. In the iments of "R." respecting the lly agree. "The poor of this want nothing from the rich y be considered a favour;—no, nothing in their behalf in the eggarly alms." "R." has here wide sweep around the whole nischief-creating charities. Till things shall be abolished, till man shall be unwilling to take ch is not the result of his own nings, there will be little hope Those who give him their y him for their slave. He can- rect on the face of the round the coin of charity jingling in When he sues for a favour himself a bondman. "R." is e whole mass of charities must way, and, in the words of Samuel "free education to every child s a matter of right," must be l in their place. Almshouses, chools, national schools and s, church property inclusive, the actual occupants may die l all be applied to the purpose l education, in schools to which l be alike eligible, without re- ank or condition. But more is commonly regarded as edu- required. Not mere reading g, but the training of the judg- s to place the people beyond ice either of the charlatan, the e, or the despot, is that educa- is *wanted, in order* that they *rong in the power of* know-ledge. A nation thus educated will never need "charity," and its accompanying host of debasing influences. If proof be required how charity can debase the objects of it, let the doubters consult the late Report on the Poor Laws. An attempt has been made to throw discredit on that work, as inhuman in its tendencies, but it is both wicked and mischievous so to do. Some of those engaged in getting up the Report are men of the highest humanity, and especial friends of the poor, so far as the term "radical" may be held to convey that meaning, *i.e.* they are promoters of "the greatest happiness of the greatest number." By destroying charities the working classes will be made habitually more self-dependent, and will assume more and more of the bold aspect of freemen. Misrule, which has kept up ignorance, and thus produced misery, has led to the establishment of both permanent and occasional charities. Where permanent charities exist, there are numerous persons who will be brought up solely with the view of profiting by them. With regard to the occasional charities,—the winter dole of soup, blankets, and coals to the poor, and the ale and beef given on the occasion of rich men's birthdays,—they do more evil by demoralisation, by enfeebling the powers of self-dependence, than they cause of good by temporary relief. The most prominent givers of these charities are, for the most part, the advocates of irresponsible rule. The time will come when the poor man will turn away from them in scorn, regarding them only as a bribe of small value, intended to secure his silence as to a robbery of large amount perpetrated on himself.

"R." asks whether people "will not increase whether they have land or not? and whether they must not be supported whether they have the means of producing their support or not?" And further on, "If surplus produce is the desideratum, why not work our natures up to a Hindostan pitch, and commit the crime of infanticide?" To this I answer, that the number of children may increase, but the surplus number will infallibly be killed off by disease, arising from insufficient food; and I regard this mode of death as infinitely more cruel to the sufferers than actual infanticide, though perhaps not quite so brutalising in its effects on the community at large.

"R." speaks of the "numerous progeny of half-starved labourers," as compared with the scanty progeny of the luxurious wealthy. But the numerous progeny, if the parents be really half-starved, and not nominally so, *i. e.* if they be starved to the diseased point, will die off soon after birth, just as rapidly as the squalid offspring of the diseased wealthy. Infant mortality is much greater amongst the poor, *i. e.* the very poor, than it is amongst those classes of the community who are abundantly supplied with food. I agree with "R." that it is not likely that the time will arrive when men will devour each other for want of food, and for the reason before stated, viz. that the check of misery on the outskirts of society stops the increase of mouths till food is once more artificially increased.

That "the decrease of population in many parts of the world is as great as the increase," is no argument against the misery created in those portions where the population is artificially and too rapidly thickened. With regard to the decline of population in the Roman territory, it is more likely to have been caused by the insalubrity of the climate, than that the latter has been caused by the former, though it is true that the causes may act and react. There is evidence that the *malaria* is by no means confined to the marshes; towns, apparently well drained, are afflicted with it, and, what is more strange, one side of a street is frequently healthy while the opposite side is malignantly pestilent. This probably arises from stagnant waters beneath the surface, lying on the rock, or in chasms of the rock, which forms the under stratum at a considerable depth. But, so far as knowledge has hitherto advanced, there would seem to be no facility for draining, save at an expense which could not be repaid, and therefore not likely to be undertaken. The knowledge we have of the effects of *malaria* on the coast of Africa, and of its local partialities, would seem to bear out the fact that all is the result of stagnant water in hot climates. In the Italian towns it is poisonous gas, generated by decomposed water, and ascending wherever it can find an orifice. I remember an instance of an old house in London, in a remarkably healthy situation, which was on one occasion drenched *with water by several engine hoses being worked through it to* put out a neighbouring fire. The consequence was, that after the lapse of several weeks the whole family were attacked by the same kind of ague as prevails on the borders of the fresh-water lakes in Canada. In many parts of Italy ancient rivers with water stagnating in them may account for much disease, but not for all. In the vicinity of Vesuvius the water disappears from the wells some time previous to an eruption. May not water be thus conveyed by rents and fissures beneath the surface to considerable distances? In many countries it has been no uncommon thing for the population to become partially unhealthy after the occurrence of an earthquake; and an accompanying circumstance is mostly the disappearance of the superincumbent waters beneath the surface.

To a certain extent the statement of "R." is correct, "that the greater number of labourers the greater relative produce;" but this can only be "under a well-organised and well-governed system," and as long only as production has not reached its maximum. But "R." will allow that we are very far from such a system at present. "R." says, "every extensive distributor becomes a non-producer, and adds another weight to the poor man's burthen." This is not a correct statement. The more extensive the distributor, the less will be the total number of distributors required; and though distribution is not production, production would be of no use without distribution; therefore, a distributor is a useful person in the state. All dealers are distributors; and surely "R." will not deny that dealers are necessary persons between the farmers and the consumers. Again, I agree with "R." that the mass of the population are by no means reckless on the subject of producing children without the means of maintenance; but there are numbers of them who are so, as is evidenced by the Poor Law Report, and it is very desirable that this should be remedied by education. Let any man read the statements of the condition of the working classes of Manchester, and then believe, if he can, that it would not be a desirable thing to check such a population.

In no way do I advocate the principle, that "only monied men should have children." The rationale of the matter, if we were not to take individual feelings into the account, would be, to keep up the

population from those members of the community who unite the most desirable qualities, as physical health, symmetry of form, high intellect, and lofty moral qualities. But the love of offspring resides in most human beings; and, as a matter of fairness, of justice, all are entitled to a share, who are not likely to inflict evil on that offspring by hereditary disease, either of body or mind. The question, then, becomes a matter of calculation. In England the population, according to the tables, can be kept up to any given standard if three children per family are produced; in Holland it requires four and a half, or nine to two families, as the climate is less healthy, and the mortality greater. We may, therefore, assume that if the rich man has more than three children, it must be at the cost of his poorer neighbour. If the poor man has more, he must saddle a portion on his rich neighbour; and if both have more, and mischievous legislation prevents the import of food, or a larger production, misery must be the consequence. Thus far I have argued the matter in a physical point of view; but there is a much more important matter to be discussed.

If a man and his wife possess three children, the labour of the father will support the family comfortably, and the mother will be enabled to attend to their moral training. But what will be the consequence if the numbers are increased to six? That the whole time of the parents will be taken up in procuring food; and that the minds of the children will be neglected, unless by hirelings, and the parents will lose their affection. Even in the case of rich men the same thing occurs. They have to attend to their estates, or their business, and they know little of their numerous offspring, the control over whom, if they have any at all, is by means of threats and not by affection. To what cause but bad training are the constantly occurring disputes of families to be attributed? What is the feeling in making what is called a "provision" for the children in after life? What but to get rid of them? Whether as cadets to India, or as placemen or pensioners in England, or as bishops, priests, or deacons, the same feeling prevails which caused them to be sent to school in childhood—to get rid of them. The cold, unfeeling calculation *with which* people, bearing even reputable names as worthy members of society, send off their children to India, with the almost moral certainty of never again setting eyes upon them, seems to me perfectly atrocious in human beings. It is precisely of the same nature as the instinct which prompts the lower animals to drive away their offspring as soon as they are able to shift for themselves, and never again to care for them. In the case of the young men who are sent out to India the matter is bad enough; but what are we to think of the licensed prostitution to which so many young women are driven forth? It is a mistake to suppose that the rich man can have a numerous family with impunity from pain, any more than the poor man. He must suffer a penalty, even though it be not precisely of the same kind.

I must now advert to another part of the question. "R." dissents from late marriages, and I think with much reason; but he surely is not amongst the number of those who regard marriage merely as a legal provision for the gratification of the sexual appetite. I know that many political economists have taken it up in this light; but surely no man of refined feelings, such as "R." alludes to in talking of "weel-placed luve," can thus regard it. Surely, when two persons of refined minds and opposite sexes agree to live beneath one roof, it is the link of sympathetic affection which binds them together, and not mere animal passion. This cannot be: the latter is but an adjunct, and not the prominent consideration: otherwise it were bestial. It is a clear case, that reasoning beings do practise abstinence before marriage; but no one who talks or writes on the matter seems to entertain the slightest idea that it may become a duty to practise abstinence after marriage. Yet nothing can be more certain; and the time will come when it will be held as disreputable for a man to have more children than he can do justice to, physically and mentally, as it now is to have illegitimate children. This matter requires much pondering on. I will grant "R." his position, that the time may come when the increase of food for the body may be a comparatively easy matter; but how will he increase the food for the mind? Mental training cannot be performed by the steam-engine. The size of a theatre may be increased

ad libitum; but the faculty of hearing and seeing cannot be extended in the same proportion.

"R." is rather poetical in his predictions of what the world may eventually become, and I can enter into the enthusiasm of his feelings on the subject; but, as a matter of fact, I am constrained to criticise. In America there is much to be done still to extend the race of man; and it is possible that the day will arrive when, by art and industry, the great desert of Africa will lose its character of a barren sand and become a huge green oasis. Civilisation may also people Asia with reasoning beings; the Pyrenees and the Alps may also bear much cultivation; but the tops of the Andes are beyond the limit of vegetation, unless the progress of art shall effect a change in the climate. The floating-gardens also may be a mere question of expense; but the proposition to make three or four worlds out of one by means of galleries one above another, on which to maintain corn-fields, will not do at all, unless moveable suns shall be established between the ranges of galleries. In the Cevennes, in Languedoc, galleries exist in the steep mountain slopes, one *above* another, but then they are also one *behind* another. They are formed by building up walls of rough stones a few feet in height, and then combing down the surface of the hill, and thus filling the space up to a level, on which gardens are formed. In the huge ravines of Upper Peru, which are designated by the pleasant-sounding name of "valleys," where the steep and rugged barren-ridged slopes tower into mid air, and tumbling mountain torrents roll along a narrow patch of sand at the bottom of the angle, I have also seen the same thing. Five or six galleries may be seen occasionally rising behind each other, like the seats of an amphitheatre; and the Indians train water-channels along them, by means whereof they grow every green thing that can make glad the heart of man, from fruit-trees down to beans and peas, and lucerne grass, that most exquisite food for horses. On the banks of the Douro the same thing may be observed. But in all these cases it is a preliminary that the cultivated spots be exposed to the light of heaven.

To conclude—in whatever point of view the matter be regarded, I hold that the improvement of the condition of the mass of the people, both morally, physically, and intellectually, depends on their seeing the question of population in its true light. Great comfort cannot exist unless the wages of labour be high; and high wages can only be maintained by the supply of labour being under the demand for it. There are, doubtless, good men and true to be found amongst the master-manufacturers at Manchester and elsewhere; but it may be taken as a fact, and the Factory Commission evidence will bear me out, that the major part of them regard their workmen merely as a species of animate machines, to be killed off whenever necessary for the sake of more rapid production, just as planters destroy their negroes by over-work. They like to have workmen in surplus, knowing that the competition will then give them labour cheap. I have occasionally associated with some of them, of that class who enacted the "massacre," and a more coarse or selfish race I never recollect to have encountered, even amongst labouring people, and certainly never amongst people of equal means. And how should it be otherwise? The gaoler is as much a captive as the prisoner. At fourteen years of age the sons of manufacturers leave the boy-pen, which is facetiously called a school, and from five or six in the morning till eight or ten at night he is constantly employed overlooking the mill till he reaches the age of one-and-twenty. Then, if he be lucky, he may perhaps be sent abroad as a foreign agent. Some of these people scarcely speak a human language, and they are the veriest tyrants breathing. They have no time for the cultivation of their minds, and are as much to be pitied for their ignorance as the workmen over whom they tyrannise. Whenever the workmen shall limit their numbers, they will be placed in the comfortable condition of workmen in the United States, who may be held more as a species of salaried partners in manufactories than as absolute dependants, as the total profits are more equally divided. Here the workmen are scanted, and there is a great national accumulation of capital in consequence. It has been said that whenever high wages shall be paid to workmen, they will consume the capital instead of allowing it to accumulate. But those who advance the proposition do

not take it into consideration, that high wages would set inventors to work to perform all the operations more economically. It is a fact that, in the United States, though high wages are paid, capital does accumulate very rapidly, and probably from this last-mentioned cause. But in all cases the proportion between the masters and workmen, as to the division of the profits, would be more equalised were the numbers of the workmen limited. The latter would imperceptibly become small capitalists; and most earnestly do I wish, for the sake of humanity, that time were arrived.

I remain, Sir, yours, &c.,

JUNIUS REDIVIVUS.

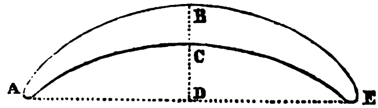
June 15, 1833.

P. S.—I shall venture to send you an answer—no, not an answer, that were presumptuous—but I shall venture to make a few remarks on Mr. Cheverton's letter shortly. My obligations to him are infinite, for thus kindly showing me the extent of my own ignorance. Like the philosopher of old, he has caused me to "know myself." There is hope for England—notwithstanding the assertion of Mr. Babbage, that science is on the decline—while men of Mr. Cheverton's powers are to be found in it. His grasp of mind is stupendous. The flimsy web of modern philosophy is rent at his touch.

THE BOMARANG OF NEW SOUTH WALES.

In our Journal of the 21st August, 1830, we gave an account, by Captain Norton, of a very remarkable projectile called the "Bomarang," used for warlike purposes by the aborigines of New South Wales, which possesses this singular property, that when it is thrown forward to a considerable distance, and misses striking against any object, it returns to the person who threw it, and even occasionally passes many yards over his head. The following explanation of the principle on which this instrument acts is given by Mr. Henry Wilkinson, of Pall Mall, in the *United Service Journal* for last month:—

"I will first describe the instrument according to the dimensions given by Captain Norton, which I find answers perfectly. The "Bomarang" may be formed of any tough, heavy wood, and is about 3-8ths of an inch thick in the middle, gradually tapering off towards the extremities, and rounded on each side from the centre until brought to an edge:—



Construction.—Let ABE be the arc of a circle; the chord ADE = 18 inches; the perpendicular = 7 inches; the width BC = 3 inches. Thus constructed, the centre of gravity will fall exactly on the edge of its concave surface at C. When used as an offensive weapon it is usually thrown with the convex side outwards; but when intended to return, it is held in the reverse position; although it will probably act in either direction if properly managed.

For the latter purpose, however, it should be thrown from the hand at a considerable elevation (45°), with a sudden jerk, so as to combine with the projectile force a rapid rotation round its centre of gravity. The rotation acts constantly in opposition to its line of flight; so that if a similar rotation could be communicated, without any projectile force, the instrument would move backwards. Now, as the force with which it is thrown is constantly diminishing while the rotation continues, it must always arrive at a certain point where these opposite forces balance or equalise each other. At that moment the weapon would fall to the ground, were it not for its flat surface and rotary motion; but in consequence of the centre of gravity being so placed that it will always present its broad surface to the air, it cannot descend perpendicularly, but slides down the inclined plane up which it has been thrown, in consequence of the whirling motion continuing after the projectile force has ceased; so that, if properly thrown, it will pass over the head of the thrower, and often to a considerable distance behind him. On the same principle, a hoop thrown from the hand, with a spinning motion inwards, will begin to return before it touches the ground; and also the curious, but not so familiar, instance of a ball fired from a musket, the barrel of which has been bent to the left, being carried at long distances considerably to the right of the object aimed at. The "Bomarang" may be illustrated in a room, by merely cutting a piece of card into the same shape as the diagram; then holding it between the finger and thumb of the left hand, at an inclination of about 45°, and striking one corner with a piece of wood, it will advance several feet and return to the spot from whence it proceeded. I find, however, that this form is not essential t

produce a similar effect, although the most convenient to throw from the hand. Any thin, flat body, of a semicircular or rectilinear figure, will return in the same manner if a rotative motion be communicated to it, in conjunction with the projectile force, at a considerable angle of elevation."

THE UNDULATING RAILWAY.

Sir,—In accordance with my promise of last week, I have now the pleasure of forwarding to you a section of a branch line of railway which is now making from the Whiston collieries to the Manchester and Liverpool main line, on which I have denoted three different undulating lines, each, in my opinion, well calculated *to prove* the fallacy of my principle, or *to establish*, beyond all question, its merit and importance.

The letter which accompanies this section is a copy of one which I addressed to the Liverpool and Manchester Directors, in consequence of their wish that I should point out the most desirable method of forming an undulating railway from the coal-pits to the main line. If you can, without inconvenience, publish this letter and the section, I think they may prove of some interest to your readers, especially as they may convey a more general idea of the nature of *an undulating railway*, and of its importance, than any remarks which have hitherto appeared in your pages.

By referring to the section it will be seen that there are two inclined planes represented thereon by black lines, one of them descending from the pits at an average fall of 1 yard in 44, the other rising to the main line at an average rise of 1 yard in 85, and meeting each other at a point about 35 feet below the level. Now these lines were described on the original section at the time I received it; and in order to save the immense expense of the embankment necessary to make a *dead level* from the pits to the main line (which expense has hitherto been considered in railway making *unavoidable*), the Directors I believe (*without reference, I am informed, to my improvement*,) thought that a fall of 1 in 44 for 517 yards, and a rise of 1 in 85 for 997 yards, would not prevent them carrying as much coal as might be required.

The moment I saw the section I was convinced that no better opportunity could present itself for the effective trial and proof of the undulating principle. I saw that I had an opportunity of proving, not only the velocity at which I could travel a given distance with a given load—not only the difference in the amount of load I could convey with a given power—but, what is of equal if not greater importance, the *probable reduction* which might be made in the estimated expense of the London and Liverpool Railway,* and the difference which *might have been* made in the cost of the Liverpool and Manchester Railway, had it been at that time known that *any given weight, acted upon by a given locomotive power, will traverse a curve, whose summits are of like altitude, with greater facility than a horizontal plane of proportionate length.*

By throwing the section into *one curve*, that is, by adopting the two inclined planes already alluded to, supposing them gradually to curve into each other, I was well aware that *nearly the whole expense of embankment would be saved.* This, therefore, at first appeared to be the cheapest plan, unless I worked close to the surface, and made a single curve by merely filling up the natural inequalities. My only doubt as to the adoption of either of these plans was the *extent of velocity* at which I could safely travel, knowing that the *full success of practical experiment must depend upon the momentum acquired by the combined forces of gravity and steam being safely and effectually maintained down the descending line of each undulation.* To avoid, therefore, in some measure, this probable evil, I proposed the undulations denoted by the blue line, which it will be seen descend from the pits at an average drop of 1 yard in 49$\frac{2}{3}$, and ascend to the main line at an average rise of 1 yard in 96, and could be constructed with as little expense of embankment as the line described on the section when I received it. At all events I was convinced that, even should the velocity down the first descent from the collieries be found dangerous, supposing the steam to be worked the *whole way*, we might *by this plan* decidedly prove the value of the inven-

* I am not acquainted with the precise amount of this estimate, but from my knowledge of the country through which the railway is intended to pass, I have little doubt but that the result of experiments on an undulating line would raise the value of the Grand Junction Railway shares from 50 to 100 per cent.

l ascertain the full effect of loco- power upon an undulating road, ll circumstances likely to prove lly useful. It, however, occurred at the Directors might object to ı on account of the length and f the first descent: I therefore out the *green line* as one which ave more than half the expense nkment, be quite free from dan- l much *more efficient* than a hori- oad.

I imagine, a mature considera- the whole plan, the Directors to adopt the line first marked their own engineer, viz. a fall of (called 1 in 43 in the original and a rise of 1 in 85—the two rving into each other 35 feet e level. Their reason for doing is impossible for me to explain, as was represented to me, the in- of employing horses occasionally l it, in their opinion, the more e line; for it will be self-evident r person who examines the sec- at they absolutely discard a line falling on the average 1 yard in d rising 1 in 96 (see *dotted* lines), more difficult one (according to erto received opinions) falling 1 in rising 1 in 85 (see *black* lines); is the more extraordinary, as the of constructing the former would ly be less than the latter. It was y remarked, *as an objection* to the , that at the commencement of the n the collieries, the descent being steep, the velocity would be dan- but it is unquestionable that the down the whole of the descent d by the *blue line*, would be *far* n the velocity down the whole of cent denoted by *their own line*. I oposed *the red line* for the descent, *blue line* for the ascent, from the here the two colours join; but this gh a material saving in the ex- ould have been the result, and it ave proved a very effective line,) o rejected.

, although the line determined y the Directors will do exceed- ell to prove the efficacy or other- my invention, yet I deeply regret should be preferred to the one I anxious to adopt, viz. the blue d more so, as I have reason to hat *Mr. Stephenson* particularly ended *a trial* of the undulating principle in this instance. Moreover, the blue line would have accurately proved *whether the Rainhill and Sutton inclined planes could not be altered at a trifling expense, so as to render them much more effective lines of road than they at present are.* It is not, however, my duty to question the discretion of the Directors in this matter; but I feel it an imperative duty to make the public ac- quainted with my views and opinions upon a subject which, it cannot be de- nied, is of extreme importance, and one which, if I am not egregiously mistaken, *will produce a saving in the expense of making railways, in the time of their completion, and in the practical operation of locomotive engines, which few at present have any idea of.*

I now wait with anxiety the trial of experiments on the branch road denoted by the accompanying section, and made as proposed by the Liverpool and Man- chester Directors; and thus far will I venture to assure them, that if the length and steepness of the descent from the pits is not so great as to render the velo- city of the carriages dangerous, and if the two inclined planes properly curve into each other, a load will be conveyed down the descent, and up to the level of the main line, with a given engine, which that same engine shall not be able to move on a horizontal railway; and, moreover, that load will be conveyed as rapidly as the same engine would convey *half its weight* on the horizontal line. On the other hand, should the velocity prove too great to admit of the *full* operation of the engine throughout the whole curve, it may satisfactorily be ascertained, by starting the engine and load on any given part of the descent, what depth and length of curve is most desirable, and what amount of load a given power *can convey with perfect safety* along various curves whose summits are of equal altitude, as well as the compa- rative speed and advantage of convey- ance between the curved and horizontal roads.

In allusion to my letter of last week, and the challenge which it contained, I have to express my hope that your cor- respondents, who may think the undu- lating railway worthy of their attention, will confine their remarks as much as possible, in answer, to mathematical dis- cussion, or statements of actual experi- ments. It is quite impossible that I can

find time to reply to every *assertion* or unsubstantiated opinion which may be (especially anonymously) expressed, and I therefore hope that my silence, on any such occasion, may not be misinterpreted. The railway to which the enclosed section refers is, I believe, *expected* to be finished in about three months. There is, therefore, abundant time for the expression of opinion: it is only to be regretted that any chance of delay may possibly occur. If, in theory, my principle stands victorious and uncontradicted, which I maintain it (at present) does, it would be well worth the while of the London and Birmingham Directors to institute the trial of immediate experiments on their own behalf. *One yard of ground should not be removed on the Grand Junction line until the undulating railway is proved a fallacy, or the contrary.*

I am, Sir,
Your very obedient servant,
RICHARD BADNALL.

Farm Hill, near Douglas, Isle of Man,
June 7, 1833.

P. S.—I observe, in your last Number, a remark by a Proprietor of the London and Birmingham Railway, that Mr. Stephenson, jun., "has declared a decidedly positive opinion" against the undulating railway. I have reason to doubt the accuracy of this statement. *If it be true*, however, Mr. R. Stephenson is in the same situation as all other scientific men whom I have challenged; and should he have *really made such a declaration*, as a man whose abilities I appreciate, and whose candour I cannot doubt, I with pleasure throw the glove, first and particularly at his feet.

Mr. Badnall's Letter to the Directors of the Liverpool and Manchester Railway.

Gentlemen,—Having, in accordance with Mr. Booth's letter to Mr. Robert Gill, of Manchester, dated the 7th inst., received from the former gentleman, by your instructions, a section of the intended branch railway from the Whiston collieries to the main line, and having, in pursuance of your wish, carefully examined the section in question, with a view of pointing out the best means of rendering it an effective and economical line of road, upon the principle which I have recently invented, I have now the honour of returning it intersected by three different undulating lines, either of which will, I trust, be found to answer the required purpose; while the *expense of originally constructing the road will be less, I humbly* conceive, than has ever yet been incurred upon equal length and similar character of ground.

In stating my opinion of the most suitable of the three lines for the required purpose, I must freely confess that the two inclined planes denoted on the section at the time I received it, one showing a *descent* from the collieries of about 517 yards, and stated to fall about 1 yard in 43, and the other an *ascent* to the Liverpool and Manchester line of about 997 yards, rising about 1 in 85, would, exclusive of the saving in construction, (if gradually curving into each other, and could the momentum gained in the descent have been effectually and safely maintained,) have proved a far more advantageous line of road, both for speed of conveyance and amount of load capable of being conveyed upon it with a given power, than any horizontal line of proportionate length; and, at the same time, would have fully exemplified the undulating principle, as far as such principle could be elucidated by a single curve.

The three lines by which I have intersected the plan are calculated to show,

1st. (See red line.) The most economical plan.

2dly. (See blue line.) The one most likely, in my opinion, to be found beneficial as an experimental line, and at the same time useful in this particular instance.

3dly. (See green line.) The plan which, considering the present uncertainty existing as to the utmost velocity with which an engine can travel with safety, would, I have no doubt, prove perfectly safe and much more effective than a horizontal railway; while it would satisfactorily demonstrate the principle, and be laid down at far less expense than any railway hitherto adapted on like ground for equally advantageous locomotive conveyance.

With regard to the first plan, whose greatest drop is 35 feet from the level, it must be evident that at the lowest point of descent the velocity must necessarily be very great, if it be expected to raise a full load up the ascending curves; and although the expense would be trifling to alter this line, should such velocity be found inconvenient or dangerous, yet, if my opinion were required, I should feel it my duty, in preference, to recommend the blue line for an experimental trial.

In the undulations upon the blue line I have, it will be seen, taken an average drop of about 1 in 49⅝ from the collieries to the lowest point of descent, which is about 31 feet from the level, and an average ascent to the main line, as nearly equal to the Rainhill and Sutton inclined planes as I could describe, viz. 1 in 96. My motive for doing this was to ascertain (should this line be adopted) the amount

ie capable of being drawn, and ity attainable, up an undulating plane of 1 in 96, which might be ed with precision by starting the id load upon such part of the opscent as would produce a momen-.l to that now attained on a hori-ailway before commencing the n 96. In other respects, I cannot wing that this line will be found r the favourable expectations I of its general applicability to the required.

'ever, the difference in expense be erial object, and if it be not an importance to ascertain the result ment up an inclination of 1 in 96, (referring only to my doubts as ent of velocity at which an engine ly travel) certainly recommend lenoted by the green line as the l best for a first trial; and while constructed, I conceive, at one-xpense of any other line hitherto pon similar character of ground mveyance of full loads, I have no at greater weight of tonnage carried, and a greater velocity upon it, than upon a horizontal nade direct from the collieries to pool and Manchester line.

beg to be understood, that in pre-the Board of Directors three dis-iods of constructing this railway plan, it is not with any view of myself by the supposition that answer if another fail, but solely nxiety on this first occasion to be those circumstances which might ered most conducive to eventual id to the trial of experiments of nportance; and I am the more o be understood on this point, as before observed, being con-w little is at present known as to t of speed safely attainable on a I should feel it my duty, if con-an engineer, to recommend the n.

'efore, the extra expense be not le, I should prefer the plan de-the green line; but should it be recommend, with almost equal e, the adoption of the blue line, ly satisfied that either of them e the decided superiority of the g over the horizontal railway.

lusion, permit me to express the with which I shall furnish any rmation in my power, or attend structions I may receive.

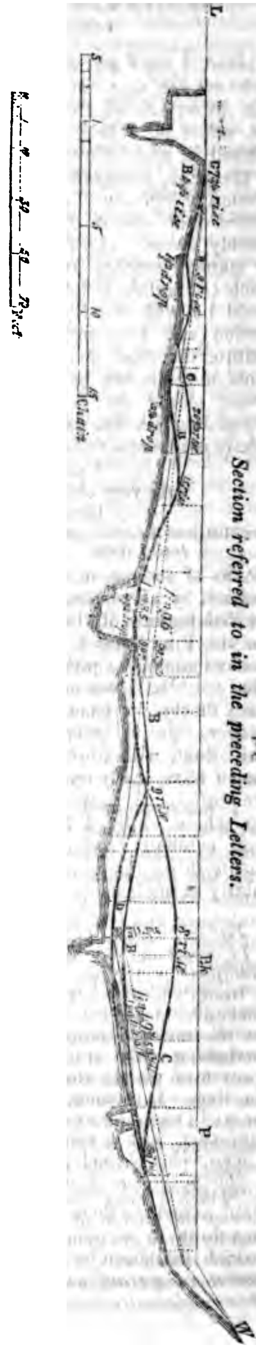
I have the honour to be,

Gentlemen,

y faithful and obedient servant,

Richard Badnall.

May 27, 1833.



Section referred to in the preceding Letters.

Explanations.—L is the level of the Liverpool and Manchester Railway. W the Whiston Coal Pits; Bk. Brook. P plantation. The curved line marked B is the blue line alluded to in Mr. Badnall's letter to the Directors of the Liverpool and Manchester Railway; C the green line; and D the red.

LOCOMOTIVE MACHINERY EXTRAORDINARY.

Sir,—I have just received your Magazine for May. I hasten to thank you for the notice (p. 80) you have been pleased to take of my wish to call attention to my invention for propelling carriages on common roads by manual labour only. You will probably allow me to say that you mistake the matter altogether when you imagine, that I propose, by the aid of a complicated machine, to enable a man to walk, and move the weight of a machine, added to his own, quicker than he could without such a load. Such is not the case: the man, so far from having a heavy load to move, has a comfortable ride. It would be as much out of the way to imagine that the man who supplies one of the steam engines on the Liverpool and Manchester railroad with fuel, moved the engine in addition to his own weight. I must admit, that a new invention of which a man has no conception, which acts in a manner quite unusual, and which, on account of its power, cheapness, and simplicity, is at variance with his preconceived notions of things, is very difficult to think and speak of. You have overlooked one thing which would have satisfied you that I was not misled by a deceptive theory. I have said that the invention was put to the test of experiment. I will now, with your permission, describe some of my early experiments.

I made a small carriage upon four wheels, by nailing a few rough boards together, like a box without a lid, rounding the four ends of two pieces of inch and a half deal with a chisel and file for axletrees, and boring holes in four pieces of boards, made round with a saw and chisel, for wheels. The box being nailed on the axletrees, I had a carriage roomy enough to sit down in, to which I fixed a small machine, made entirely of wood and weighing only sixteen ounces, by the power of which, and while sitting in the carriage, I travelled rapidly along the room. I have subsequently used a stronger machine, one weighing four pounds, by which I was able to drive the carriage over pieces of wood three inches thick, laid across the floor. I applied the same machine to a pair of old cart wheels which had been laid up as useless in the corner of an orchard for two years, and instantly dislodged it out of its resting place. It was then applied to a farmer's empty waggon, which it moved about. When I inform you that this machine was constructed by myself, in a rough manner and entirely of wood, you will perceive that I have not said too much of the invention. I estimate that the weight of a machine, of sufficient strength to propel a waggon of three tons, at the pace that horses usually go, will not exceed fifty pounds.

I have lately been to the Liverpool and Manchester railroad to see how the steam engines work, and I am greatly astonished that such complicated, clumsy, expensive, noisy, and dangerous means of conveyance should be used in the present day. I am also surprised that horses, expensive, dangerous, and troublesome things as they are, should be used, since machinery, safe and cheap, can be made to supersede them. Were I possessed of the means, I would immediately take out patents for all the countries in Europe and America, the invention being of such extensive application that it can be applied to nearly all the work done by horses.

In your remarks on Mr. Godson's bill for the improvement of the patent laws, you say, "an invention will sometimes be so simple that you have but to name it to give to numbers of ingenious and well-informed men a complete insight into its nature." Such being the case, it will be very imprudent in me to give the slightest description of my invention to any one, before I have sufficient security for compensation. Should I not meet with the encouragement I expect in my native country, I will remove to France or America.

What I require before making known my invention is, that sufficient security be given for the amount I demand. I will then apply it to a small carriage and travel to London. I will also apply it to a loaded waggon, so as to convince, in a few minutes, every one that sees it, that it is far preferable to steam or horses.

I am, Sir,

Your obliged humble servant,

T. M., a Mechanic.

June 15, 1833.

N'S ENCYCLOPÆDIA OF COTTAGE,
:M, AND VILLA ARCHITECTURE.

e Twelfth and concluding Part.)

present our hearty congratulations Loudon on the successful com- of this arduous undertaking. Much ias contributed by his former works advancement of those productive which the social welfare, and, ulti- , the intellectual elevation of com- es depend we do not think that them comes up to this in extent riety of usefulness. The general of this Encyclopædia, as our read- aware, is to promote the improve- of domestic architecture of every from the highest to the lowest; y the architecture of the abodes of ce and luxury, but those of the st and most enduring penury— at once, how much of comfort and :e there is within the reach of even st favoured sons of fortune which ve not yet attained, and how much odged, the very poorest may be, ey at present are. Now there is, comprehensiveness of this design, argeness of the philanthropy which es it, a feature of excellence such rchitectural work could ever before f, and such as even the best of Mr. 's other productions, eminently use- ey all are, have not reached. "The f architecture in all ages and coun- s Mr. Loudon truly observes, "have been for the most part directed to buildings, and to the mansions of , noblemen, and men of wealth; at have been hitherto considered rior orders of society have, for the art, been left to become their own ts." Mr. Loudon's ambition, on trary, is to be the architectural ad- not the actual architect) of both d poor, or, to use again his own "to show how the dwellings of the mass of society may be equalised t of all essential comforts, conve- , and beauties;" and if he has any , it is to the side (which in this is side) of those classes whose in- have been hitherto so much neg- as well by architects as politicians. nmences, accordingly, this Col- or Encyclopædia of "Designs for Dwellings," with cottages suitable labourers, with and without chil- passes on to the houses of farm bailiffs, head gardeners, and small master mechanics; then treats of farm houses and farmeries, through all their varieties; next devotes a chapter to country inns and public houses, and another to paro- chial schools; and concludes (where other writers on domestic architecture have only begun) with designs for villas or country mansions, and their various appendages, as conservatories, aviaries, stable offices, riding houses, &c.

Mr. Loudon's mode of treating each of these subjects differs also from that of every writer who has gone before him. A de- sign for a house has been hitherto com- monly regarded, as embracing merely the external walls, and the partitioning of the interior area into a given number of apart- ments; but with Mr. Loudon it compre- hends also every thing which can contri- bute to render the house a comfortable re- sidence for the intended occupant, such as arrangements for warming, lighting, and ventilating it, and the internal fittings up of every description, even to the most or- dinary articles of household furniture. We expressed some doubts, while the work was in progress, as to the propriety of the last of these particulars being in- cluded, and are still by no means recon- ciled to the union of designs for Palladian villas, with designs for wash-hand basin stands and kitchen tables and chairs. Mr. Loudon, with a view apparently of obviat- ing this objection, has added to the ori- ginal title of "Encyclopædia of Cottage, Farm, and Villa Architecture," the words "and Furniture." But though this amended title may suit the book *as it is* better, it still leaves the objection to the union of the two subjects (to the extent, at least, to which it has been carried by Mr. Loudon,) as it was. In a general in- troduction to the work, Mr. London speaks of "submitting a series of designs for the finishing, fittings up, fixtures, and furniture suitable to the different descrip- tions of cottage, farm, and villa buildings, and accompanying these with remarks on their fitness for the end in view, such as lighting, heating, ventilating, &c., as well as with analytical and critical remarks on their style or beauty," and of "*thus show- ing* the necessity of architects including the study of furniture in that of their pro- fession, so as to be able to give designs for furnishing a house as well as for building one." The "showing" in this passage, however, really shows no more

than the bare fact, that Mr. Loudon has pronounced the union of the two studies to be necessary, and neither here nor elsewhere has he favoured us with any *reason* for subscribing to his opinion on this head. If it be fit that an architect should also turn upholsterer, we apprehend that the converse of the proposition must hold equally true, that no person can be a good upholsterer who is not also a good architect; but, doubtless, this is more than Mr. Loudon would think of affirming. We suspect that the best apology which the case admits of is to be found in the quality of the materials which have been thus arbitrarily brought together; for, whatever reason there may be, to deem some portions of the work out of place, there is not a paragraph of it which does not contain some useful piece of instruction or other, connected with house building or house furnishing. Some regard must be had, on the other hand, to the considerable addition which the irrelevant matter has made to the bulk and expense of the volume. True it is that, taking it altogether—its eleven hundred pages of letterpress, its two thousand wood engravings,—some of them beautiful beyond any thing that has recently appeared in this branch of art,—and its hundred lithographed plates, it is one of the very cheapest works that ever issued from the British press; but if it could have been made still cheaper by being limited to the matters falling legitimately within its province, who will say that it would not have been greatly improved? The price is still considerable enough, we fear, to operate as a serious obstacle to the circulation of the work among the middle and lower classes, whose taste in architecture it is so laudably the main object of the author to improve.

Mr. Loudon thinks that, generally speaking, there has been hitherto but "very slender progress" made in architecture, and he ascribes this chiefly to the circumstance of the "science and rules having been almost exclusively confined to architects from the earliest ages to the present times." "It is in the nature of all knowledge," he observes, "held as mystery, to remain in a great measure stationary, because the minds which are engaged in it are necessarily few, and because the great object of such associations is to keep their peculiar knowledge and the exercise of their craft among themselves."—*Preface.*

We have nothing to offer in defence of either mystery or monopoly; but we must confess that we feel at a loss to reconcile these remarks of Mr. Loudon with the well-known historical facts belonging to the case. The art of building was never confined to fewer hands, nor practised with more exclusive jealousy, than when its followers were first knit together in that most secret of all confederacies, "freemasonry," and yet it is to that very period we must assign those splendid monuments of Gothic architecture which justify Mr. Loudon in elsewhere (p. 1123) ranking the Gothic style as superior, "in a scientific point of view," to every other, whether Grecian, Roman, or Italian, and as leaving, in fact, little (in northern countries like this, at least,) to be desired. It is no less certain that, since the institution of freemasonry fell away from its original uses—since it came to include persons of every occupation under heaven, as well as the knights of the square and compass—since any one who pleased, whether freemason or not, might take upon himself the exercise of the highest functions of the craft without any suitable preparation for it—that is to say, in short, ever since the art of building has become *less* a mystery and a monopoly than it originally was, there has been rarely any thing produced which could bear to be compared with the architectural works of the olden time; but, on the contrary, a general and decided declension in excellence. Do we, therefore, dispute the propriety of liberating the art from its ancient trammels? By no means. We merely cite these historical facts to show that the art has flourished most, under those very circumstances of secrecy and limitation which Mr. Loudon supposes to be most unfavourable to it—not in consequence of them, perhaps, but still in spite of them; and that we must, therefore, look to other causes for an explanation of whatever is unsatisfactory in the progress which it has made. While so many noble remains of the Gothic style exist, however, to remind us of the extraordinary degree of excellence which our forefathers attained in the art of construction, it cannot be considered historically correct to speak of it generally as having made "slender progress." It seems to us, on the contrary, to have made, upon the whole, quite as much progress as any of the other fine arts—sculpture and painting, for example—though, certainly, for a long time past,

it has not been cultivated with equal ardour, or in an equally enlightened and improving spirit. It presents rather the case of an art retrograding from a state of high advancement, than of an art in the first stages of a "slender progress." The only feasible cause which Mr. Loudon suggests for this decline is the slavish habit into which modern architects have fallen of "implicitly following precedents, and adhering rigidly to rules made, perhaps, in a former age, and, consequently, adapted to a less advanced state of civilisation, instead of testing those precedents and rules by fundamental principles, and adapting the latter to the state of society for the time being." But it is not so much, we apprehend, for "implicitly following precedents" that modern architects are to be blamed, as for making a bad choice of precedents to follow. Had the architects of Britain always adhered to that admirable Gothic style which is indigenous to the north of Europe, and is better suited to our northern climate than any other, there would have been, probably, little to complain of in their adaptations of it to modern purposes; but instead of this, they have run all over the world in search of other styles to imitate, as foreign in their nature as in their origin to the circumstances of this country,—have never stuck long nor uniformly by any one style—and have covered the land at last with as monstrous a jumble of Gothic, Grecian, Roman, Saracenic, Egyptian, Hindoo, Chinese, and other forms, as it is easy to imagine. The thing to be regretted is, not that our ancient style of architecture wants adapting "to the state of society for the time being," but that our architects should have been guilty of the folly of attempting to supersede it by other styles greatly inferior to it, not only in scientific merit, but in adaptation to the circumstances of the country. For, whatever advances civilisation may have made in other respects, it has confessedly not carried us a single step beyond the excellence which was realised centuries ago in the Gothic style. Mr. Loudon himself justly observes of it (p. 1123), that there is still "no style in which unity of form and system can be more easily given and maintained," and that it is, in all its varieties, "in an especial manner adapted for domestic use."

The hypothesis which Laugier, Wood, de Quincy, and others, have brought into vogue, that architecture is altogether an imitative art—that is to say, an art, each variety of which is founded on the imitation of some rude type, such as a grove for the Gothic, a hut for the Grecian, &c., Mr. Loudon thinks "altogether fanciful," and demolishes, to our entire satisfaction, in two or three sentences. It is more to the purpose, as Mr. Loudon well observes, to keep in mind that, be the style intended to be followed what it may, an architect must be governed by certain "abstract principles of composition, as much as if no style were resorted to," such as unity, variety, simplicity, proportion, harmony, fitness, &c. Mr. Loudon has treated, at considerable length, of each of these principles, and with consummate ability. There are not many professional gentlemen, we ween, who would not be greatly edified by an attentive perusal of the chapters which the author has devoted to this branch of the subject. We have marked for extract several striking passages in this part of the work, but have already extended this notice so far that we must content ourselves with a single quotation—and that not the best we could select to exemplify the ability of the author, but the one which seems to us most likely to interest the generality of our readers:—

"*Magnificence* in expression is produced by the union of magnitude with general simplicity of form and great richness in the details. A large house, simple in its general forms, with large spaces between the external indications of the different floors and between the windows of the same floor, but with the walls terminating in a highly enriched cornice, and with richly decorated architraves round the windows and doors, must be felt by every one to convey an idea of large and lofty apartments within, and of great wealth in the builder. 'To produce the effect of magnificence in architecture,' Wood observes, 'three things seem to be necessary, viz., greatness of dimensions, simplicity of design, and richness of decoration. To satisfy the mind, after examination, three other things are requisite, viz., correctness of proportion in the parts, graceful drawing of the details, and delicate execution of the mouldings and ornaments. Great space left between the ranges of windows gives an air of solidity and magnificence to the front, and suggests the idea of lofty rooms within; and it is a great point gained when, in addition to the magnificence which is seen, the artist can excite the idea

of magnificence which is not seen.'—*Letters*, &c. In general, magnitude in connection with any circumstance which gives evidence of great wealth is favourable to the idea of magnificence. The stables of the Prince of Conde, at Chantilly, are magnificent from their magnitude and their costly finishing, though, as the traveller Duppa observes, they are in the highest degree unfit for the purpose. They are without accommodation for a bushel of corn or a single truss of hay; but they are upwards of 40 feet high from the floor to the ceiling, and 600 feet long, with walls of polished freestone, and a magnificent dome in the centre. In the interior of towns and cities, it is an evidence of great wealth to find mansions situated in the midst of trees and gardens, surrounded by lofty walls, and entered by magnificent gates. Such mansions are more common in Moscow and Warsaw, and even in Paris, than in any other cities of Europe. In London, on the contrary, though there are numerous mansions, in all respects superior in accommodation, comfort, and luxury to those of any other city in the world, yet, from their being in close contact with each other, and ranged in lines without any thing to distinguish them from common street buildings but the absence of shops, and their having a somewhat more extensive frontage, they are totally without that expression of magnificence to which they are amply entitled from the expense incurred and the accommodation produced. In the last great square which has been, or perhaps ever will be, erected in London, Belgrave-square, where the houses rent from 500*l.* to 1000*l.* a-year each, there is not one of them that can have the slightest pretension to magnificence. They have not even an element of this quality; and if a city tradesman, on his entering the square for the first time, were informed that houses, which are at present occupied by dukes and other nobles of the first families in the land, were the residences of city merchants or wealthy retired tradesmen, there is nothing in their appearance which could lead him to express the slightest degree of surprise. Let such a person go to Paris, and observe the hotels which here and there occur, enclosed by walls, entered by magnificent gates, and surrounded by thickly-wooded gardens, and the evidence of great wealth which these appearances afford will prevent a doubt from arising in his mind of the grandeur and magnificence of their occupants. The impression will be still stronger if the traveller proceeds to Warsaw, to Moscow, or to Florence, Rome, and some of the other great cities of Italy. The truth is, that Englishmen prefer displaying magnificence only in the interiors of their town houses, reserving all magnificence for their palace-like villas in the country."—P. 1118.

We are glad to observe, from a notice on the cover of this last part of the work, that though Mr. Loudon does not calculate on its remunerating him for the heavy expense incurred in its production before the lapse of "several years," it has "already had an extensive circulation." Now that the work may be had in a complete state, we make no doubt that he may reckon on a large increase of purchasers. We readily believe him, however, when he observes, "We have far higher satisfaction than could be afforded us by any pecuniary gain, in the contemplation of the immense good which such a work as the present must inevitably effect for the great mass of society in the British dominions, in America, and in Australia." Immense good we think it well calculated to do; and shall be as much disappointed as the author if it do not prove also inevitable.

ANSWERS TO INQUIRIES.

Scagliola.—Mr. D. Arkwright will find the process of manufacturing this admirable imitation of marble described at length in "Nicholson's Practical Builder," p. 382. Although of foreign origin, this art is now carried to greater perfection in England than in any other part of the world. "Scagliola," says Mr. Nicholson, "is as strong and durable as real marble for all works not exposed to the effects of the atmosphere; it also retains its lustre as long and equal to real marble, without being one-eighth of the expense of the cheapest marble imported."

Copper Tokens.—"A Country Shopkeeper" is mistaken in supposing that he is at liberty to "revive the old practice of private tradesmen issuing tokens of their own with appropriate devices," &c. The practice was expressly abolished by 53 Geo. 3. chap. 114, and 57 Geo. 3. chap. 46.

Silk Hats.—We are not aware of any premium having been offered (as "S. S." has been informed) by the hatters of London, for a mode of manufacturing the case of a silk hat without the seam, but we have understood that it is considered a desideratum. Since hose are knit by means of the stocking-frame without seam,

why might not hat bodies be manufactured in a similar manner?

Buhl Work.—"Amateur" has been misinformed—we rather think wilfully deceived—for the exactness which distinguishes this species of work could never have been obtained in the way he mentions. The *real* process is thus described in the Encyclopædia of Mr. Loudon, reviewed in our present Number:—"Two pieces of veneer of two colours are put together, with paper between them, each being glued to the paper. Upon the surface of the upper one is placed the print or drawing of an ornamented border, the outlines of which are cut through by means of a very fine saw, made of a watch-spring. The parts are then separated; that which was taken from the dark wood is let into the light wood, and *vice versa*.

The Potteries.—"A Constant Reader," at Newcastle-under-Line, who informs us that we "have put all in commotion" by the recent publication of our "Secrets in Pottery," but is himself well pleased with the light we have thrown on this interesting art, requests us to ask "the old gentleman of Hulton Abbey" whether he cannot also supply the readers of the Mech. Mag. with the recipes for the "chalk and china bodies and glazes?" We can at once make answer for our friend "the Friar" in the affirmative. He has, in fact, already supplied us with these recipes, and with several others which are necessary to complete the series; but "the Friar," though his knowledge is modern, writes in so ancient and crabbed a fashion, (which, considering he is only a "Friar *Redivivus*" is not surprising,) that it takes more time than we have been recently able to command, to furnish the printer with an intelligible transcript of his manuscript. We shall, however, give two or three of the remaining recipes next week.

Raising Water.—A very simple and efficient method of raising water out of a stream, for the purpose of irrigating an adjacent meadow, is described by "Viator" in our Journal of the 4th June, 1825. We think it would answer "J. D.'s" purpose well.

Avanturine.—We quote, for "A Jeweller's" information, the following description of the method of imitating this somewhile fashionable colour on fancy works of wood or pasteboard:—First prepare a varnish of the following materials—pure alcohol 15 parts, Venetian turpentine 3 parts, sandaric gum 3 parts; put them into a bottle, cork it well, and place it in boiling water for three hours; then add as much powdered glass as there is turpentine and gum, that is, 6 parts; after which filter the mixture, and collect it in a bottle with a narrow mouth, which is to be kept closely corked till wanted for use. The fancy article is then to have two coats of this varnish, and two coats of a solution of gumma gutta. When dry it is to be varnished by small portions at a time, and gold powder strewed over them. If too large a space is varnished at once it is apt to dry, and the powder is not equally distributed. After the whole has been thus powdered it is done over with varnish sixteen times, and then dried and polished. It is again varnished six times, and the final polishing given to it by putty.

Electrical Communication.—The objection which "V. L." has been told exists to the formation of a line of electrical communication between distant places, consists in the rapidity with which the intensity of the electricity has been found by experiment to diminish, being nearly as the square of the distance inversely. We do not believe that an electrical discharge was ever transmitted through a wire "many miles long," nor even the third of a mile.

Introducing Fire under Water.—We do not know why "S. A." should have failed in his attempt to introduce the burning jet of his oxyhydrogen blow-pipe under water. It has been done times without number. Perhaps he is nervous or hasty; it should be done slowly and steadily.

Adulteration of Mercury is by no means so unlikely a thing as "Pinion" imagines. It is, on the contrary, we regret to say, a very common practice. The materials used are bismuth, zinc, tin, or lead. When adulterated it is of a duller colour than usual; but the fact may be still more certainly ascertained by shaking it in a bottle with water, when a black precipitate will be speedily produced.

Copper-plates.—We cannot furnish "Copernicus" with any remedy for the injurious effect of the rust which forms on the surface of engraved copper-plates when they have been laid aside for a considerable time, but we can inform him of a very simple method by which it may be prevented. Do the plate over with common spirit-varnish, when it is laid by, and no oxidation will take place. The varnish can be easily removed by a little spirit of wine when the plate is to be again used.

The Monster Bomb, which made so much noise during the siege of Antwerp, and which was fully described in our Journal of the 9th of March, burst at the camp on the heath of Braschaet on the 18th inst. It had been three times charged; first with 21, then with 17, and afterwards with 15 kilogrammes of powder; and it was ascertained that the shell was projected to the same distance and with the same force with the smaller as with the greater quantity. On being fired the fourth time it was charged with only 9 kilogrammes of powder; but probably being too closely rammed, it split in two, throwing a piece of iron, weighing 3000 kilogrammes, or nearly 6,107 English pounds, to a distance of above 20 feet. Happily no one was wounded.

The Coinage.—A wish is very frequently expressed of late, among men of business in the City, for the introduction of some further descriptions of silver and gold coin into circulation, answerable to the general decline in prices and charges of all kinds. As it is, there are very numerous occasions wherein a higher charge than necessary is submitted to preferably to the inconvenience of carrying about a quantity of copper. Silver coin below the value of sixpence, and probably as low as one penny, might now be issued, and would greatly tend to remedy the inconvenience complained of. To make the coin larger and less liable to be lost, a greater proportion of alloy might be mixed up with the silver.—*Times*. The same thing was proposed several weeks ago in this Journal by our correspondent, Mr. Corbet, of Salop.

NEW PATENTS GRANTED BETWEEN THE 22D OF MAY AND 22D OF JUNE, 1833.

Jonathan Hayne, of Clerkenwell, silversmith, for certain improvements in the mode or method of making or manufacturing metal spoons and other articles. Six months to specify.

Robert Beart, of Godmanchester, miller, for certain improvements in making or producing tiles for draining land, buildings, and other purposes. Six months to specify.

James Jones, of Salford, machine-maker, for certain improvements in the making of rovings, spinning and doubling of cotton, silk, flax, and other fibrous substances. Six months to specify.

Francis Molineux, of New Bridge-street, Blackfriars, gentleman, for certain improvements in machinery or apparatus for making paper. Six months to specify.

Note.—The four preceding patents were granted between the 22d of May and the 1st of June, but the list furnished to us does not state the particular date of each.

George Harris, of East Dulwich, Surry, Esq., for a method for the reducing and preparing various vegetable substances (not hitherto in use for the like purpose), and for the manufacturing them into articles in general use, heretofore usually made from hemp and flax. 1st June; six months to specify.

John Barton, of Goswell-road, engineer, for improvements in the construction and application of pumps and machinery for raising fluids and other purposes. 1st June; six months to specify.

George Carter, of Nottingham Lodge, Kent, gentleman, for certain improvements in paddle-wheels. 1st June; six months to specify.

Pierre Antoine Angilbert, of Upper Charles-street, Northampton-square, Middlesex, gentleman, for certain improvements in preserving animal, vegetable, or other substances. 1st June; six months to specify.

William Jessop, of Butterley Hall, Esq., for certain improvements in constructing railways. 1st June; two months to specify.

Charles Madeley, of Gilson Hall, parish of Coleshill, county of Warwick, farmer, for a scarifier or harrow. 6th June; two months to specify.

Charles Jones, of Birmingham, gunmaker, for a new arrangement of additions to and alterations in certain parts of gun and pistol locks. 12th June; six months to specify.

James Caldwell, of the New Crane, Shadwell, Middlesex, coal-merchant, for certain improvements in cranes, vessels, and apparatus for delivering coals from shipping to wharfs, warehouses, waggons, or carts, without the employment of lighters as usual; and the whole or parts of which said improvements are also applicable to other purposes. 12th June; six months to specify.

Thomas Wrigley, of Bridge Hall Mills, near Bury, county of Lancaster, paper-maker, for an improved pulp-strainer to be used in making paper. 20th June; six months to specify.

Joseph Gibbs, of East Smithfield, engineer, and Augustus Applegarth, of Crayford, Kent, calico-printer, for their invention of certain improvements in the construction of railroads, bridges, jetties, and aqueducts, parts of which may be applied to other useful purposes. 20th June; six months to specify.

Andrew Ure, of Charlotte-street, Bloomsbury, M. D., for an improved apparatus for evaporating syrups and saccharine juices, which is also applicable to other purposes. 20th June; six months to specify.

William Newton, of Chancery-lane, for an improved apparatus for boiling, evaporating, and concentrating syrups for the production of sugar, and also of saline liquors, or for the crystallisation of salt, which apparatus may also be employed in the process of distillation; being a communication from a foreigner residing abroad. 20th June; six months to specify.

INTERIM NOTICES.

We learn by a note from Mr. Hall, that he called at our office three times about six weeks ago to show us the glass model of his condensing apparatus, but that he missed seeing the Editor, who was ill at the time of the prevailing malady. We were not, of course, aware of this fact at the time we penned the note to Mr. T. V. Robson's letter in our last Number; and readily comply with Mr. Hall's request to take the earliest opportunity of making this much known to our readers.

Junius Redivivus's reply to Mr. Cheverton in our next, if possible.

We regret that S. Y.'s prompt and clever answer to Mr. Ham's Railway problem must also stand over for a week.

J. E. will find a letter for him at the post-office, Kingston.

Communications received from D. T.—Mr. Bayley—Mr. W. Watson—Billy Biter—P. C.—Horologicus—S. D.—Nemo—Duty D. Dubikins.

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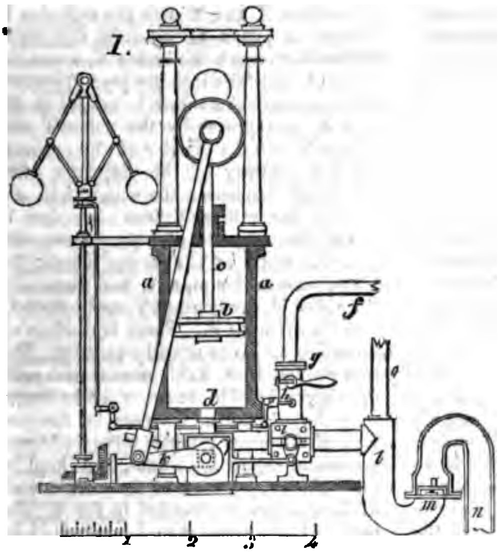
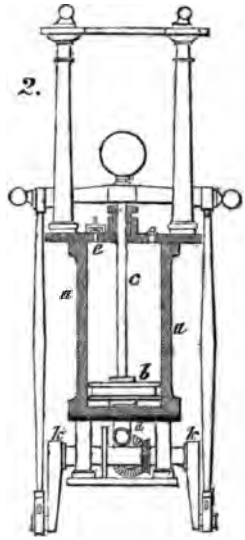
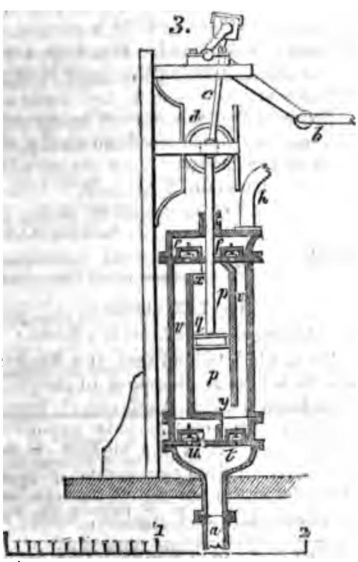
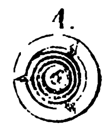
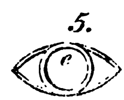
DIETZ'S STEAM-ENGINE AND WATER-PUMP.











DIETZ'S STEAM-ENGINE AND WATER-PUMP.

Sir,—When lately on a visit to Rouen, I was shewn by an ingenious manufacturer of that place a drawing of a steam-engine, invented some 10 or 15 years ago (he could not tell me exactly how many), by a Frenchman of the name of Dietz, which he thought of a very simple and compact description, and particularly deserving of attention for its expanding metallic piston, which, though not perhaps equal to Barton's, he thought well entitled to contest with it the palm of originality. He shewed me also a drawing of a water pump, with a piston on the same principle. Being myself only an amateur mechanic—if indeed so much—I told my Rouen friend that I could offer no opinion of my own on the merits of these inventions, that could be of the smallest weight; but that if he would allow me to make copies of his drawings I would endeavour to procure a place for them in a certain public repository, where they would be sure of being appreciated as they deserved, by persons in every way qualified for the task—meaning thereby, Mr. Editor, your own invaluable Magazine. This he readily permitted me to do; and I have now the pleasure of placing at your disposal the copies so made, along with the following explanatory particulars:—

The Steam Engine.

Figs. 1 and 2 are perpendicular sections; A is a vertical cylinder; B the metallic piston, composed of six pieces of brass, which are kept in a state of constant pressure against the cylinder, by an interior spiral spring; C the shaft of the piston; D an orifice for the admission of the steam below the piston; E a valve, which on the ascent of the piston opens and allows the atmospheric air enclosed in the cylinder to escape, but instantly closes on the descent of the piston, and keeps the atmospheric air excluded; F a pipe, through which and the cock-ways, G, H, I K, the steam escapes on the fall of the piston; L the condenser; M a valve to the condenser; N a pipe for the admission of the cold water; and O a tube which connects the pipe N with the force pump.

The principal advantages of this engine are supposed to consist—1, in the expanding metallic piston; and 2, in the *exclusion* (to a considerable extent at least) of the atmospheric pressure from the upper part of the cylinder, after the descent of the piston.

The Water Pump.

Fig. 3 is a vertical section of this pump; P the cylinder, in which moves the metallic piston Q; R, S, T, U, four valves; V V two conduits, which communicate by the orifices X and Y with the cylinder P. When the piston Q ascends, the water rushes in through the orifice X, opens the valve R, and falls into the pipe Z; at the same moment the water is raised in the pipe A, and passes by the valve T and orifice Y into the interior of the cylinder P; the contrary of this happens when the piston descends; the water then enters by the orifice Y into the pipe V, opens the valve S, and passes into the pipe Z, while at the same instant the water rises in the pipe A, and passes by the valve U, the conduit V, and orifice X, into the cylinder P. There is thus an alternating action constantly kept up. The four valves, R, S, T, U, are formed each of a piece of thin brass, a little larger than the orifice which serves for the passage of the water; these pieces of brass are not attached by hinges, but kept in their places by a cross of the same metal, in the manner represented in fig. 4. The handle B is intended to be actuated by manual power; and by connecting this handle with the shaft of the piston, in the manner shown at C D, a vertical motion may be obtained. Fig. 5 is a plan of the piston, E being the space occupied by the shaft.

Trusting that the present communication may not be deemed unworthy of a place in your pages.

I remain, Sir,
Your obedient servant,
E. J. SOMERVILLE.

Boulogne, May 5, 1833.

ON TAXIDERMY.

(Extracted from a Letter to a Friend.)

I am glad to find that you have not abandoned your intention of acquiring some knowledge of taxidermy;* because I know, from considerable experience, that it is an art of the highest interest, and likely to give you lasting pleasure. If we delight to see the evidences of consummate skill and wisdom, where can

* That is, the art of dressing, stuffing, and preserving the skins of animals.

we find them more abundantly exhibited than in the organisation of birds; or if beauty charm us, where is it more lavishly displayed than in their plumage? A study like this not only pleases and informs the mind—it awakens thoughts and feelings which cannot long be indulged in without making us better. You have requested me to furnish you with some aids to the acquisition of this interesting art; and I willingly undertake to communicate to you what experience has taught me. Suffer me, however, to observe, that it is not by rules of art alone that any one can acquire a real knowledge of this subject: Nature must be the mistress—Art the handmaid. It is in the woods and in the fields, by the shores of the sea, and the margins of lakes and rivers, that our first lessons must be learned. The habits, the attitudes, and the whole economy of animals should be studied by the taxidermist. Ignorant of these things, our hands will form nothing but deformity; we shall not copy, but caricature, nature. The art of taxidermy has not attracted so much attention in this country as might have been expected, considering the facilities which we possess for obtaining specimens from almost every country; (for into what corner of the globe has not British enterprise penetrated?) and it must be confessed that in this study the French naturalists have taken the lead of the English. Though we possess several ingenious papers on the subject in the "Philosophical Transactions," yet none, we believe, can be compared to the valuable essays of M. Reaumur and M. Dufresne, especially the latter, who, in the *Nouveau Dictionnaire d'Histoire Naturelle*, published at Paris in 1803, has furnished the naturalist with a vast number of useful observations. Recently, however, we have received from our countryman, Mr. Waterton, an extremely valuable essay on taxidermy, appended to his amusing book of "Wanderings;" and though I differ in some respects from that gentleman, I yet, upon the whole, think his plan is well deserving of your attention.

It would be useless for me to enter at length into the old and now exploded system, by which the bones were retained in the skin. By such a method it was found utterly impossible to impart to the specimen that pleasing rotundity of form so strongly *expressive of ease* and harmony, which is one of the main elements in the beauty of birds, perhaps of all animals; besides, it was found impracticable to clean away entirely all flesh from the bones—some few particles would adhere. Nor shall I trouble you with any account of the plan of preserving birds in spirits. To me (and I believe you participate in the feeling) there is something extremely disgusting to see a bird, naturally destined to be free as air, crushed into a long glass bottle.

Before entering into the details of the subject, I will just notice some of our English collections. Turn into the British Museum, and you will see cases filled with specimens which are perfect caricatures. Some of them look more like Egyptian mummies than any thing in nature; and as to the birds, although you may sometimes hear the great vulgar as well as the small, lauding them as if they were "beautiful exceedingly," yet, when narrowly observed, you will see that they are placed in forced and unnatural attitudes, and that the plumage is in such a disordered state as plainly evinces that little or no attention has been paid to the bracing. The Zoological collection is equally bad or worse; and, considering that this last is but of recent formation, it is a disgrace to the Society. In making these remarks it may be objected, that, in the British Museum as well as in the Zoological, there are some excellent specimens. I admit there are; but these are so few in number that they bespeak only the poverty of the collections. Contrast the specimens that I have been speaking of with those in the Manchester Museum, and I think you will readily accede to what I have said. The collection in the Museum of Natural History at Manchester is unrivalled in this country—it is really splendid. But I must not detain you on this topic; and without further preliminary I will at once enter upon my subject. I must premise, however, that in the following observations I shall regard birds only; and, as method is desirable, I shall distribute the subject as follows: — I. Of destroying life and cleaning feathers. II. Of skinning and cleaning skin. III. Of forming the body; and herein of wiring, fixing eyes, colouring beaks, mounting, and bracing.

(I.) Some curators extinguish life by dislocating the neck of the bird; others,

by striking the back of the head against any hard substance: but both of these methods are objectionable. The first is liable to rob the neck of its feathers—the latter to cause an infusion of blood to the head, which, issuing through the beak, injures the specimen. Mr. Waterton's method of killing his birds was by pressing them hard with his finger and thumb just behind the wings. My plan is not very dissimilar—I place my thumb upon the windpipe, above the breast-bone, taking care that the feathers are smooth in my hand to prevent them being broken. A very few seconds will (if the pressure be not relaxed) extinguish life. Too much care cannot be taken to prevent the loss of feathers; for if, to conceal such defects, we displace the adjacent feathers, the natural and beautiful order of the plumage will be deranged, and the deficiency may be at once perceived by an experienced eye. If the plumage is soiled, wash it in water without soap, taking care to agitate the feathers until they are dry; if left to dry of themselves the laminæ become displaced, and the whole will have a ragged appearance. This is better done before the bird is skinned, because holding it before the fire, though at a considerable distance, would cause the skin to shrink too much if the body were previously taken out.

(II.) The next thing to be done is to strip off the skin, but first fill the mouth and nostrils with cotton. Begin by dividing the feathers down the middle of the belly, then with a sharp penknife, cut through the outer skin just below the breast-bone, and continue the incision to the vent. Take especial care not to cut the skin which encloses the gut; if you are unfortunate enough to cut it, the smell will be extremely offensive; besides (which is of more importance) you will be in continual danger of soiling the feathers. When the incision is made, loosen the skin from the body, so far as to enable you to press out the thigh, which must be cut through at the middle joint. This done, introduce cotton between the skin and body where it is separated. The same mode of procedure must be pursued on the other side. The skin should then be separated from the body on each side the vent.

"Bend the tail gently down to the back, and while your finger and thumb are keeping down the detached parts of the skin on each side of the vent, cut quite across, and deep, until you see the back-bone at the joint, and then you have all the root of the tail, together with the oil-gland, dissected from the body. Apply plenty of cotton. After this seize the end of the back-bone with your finger and thumb, and now you can hold up the bird and turn it round and round as occasion requires. While you are holding it thus, contrive, with the help of your other hand and knife, by cutting and pressing, to get the skin pushed up till you come to where the wing joins on to the body. Cut this joint through, do the same at the other wing, add cotton, and gently push the skin over the head, and continue skinning till you reach the middle of the eye. Cut the nictitating membrane quite through, otherwise you would tear the orbit of the eye; and after this nothing difficult intervenes to prevent your arriving at the root of the bill."*

When you have completely separated the skin up to the beak, cut through the back part of the skull, leaving a small portion adhering to the severed neck. Through this opening scoop out the brains, and having cleaned the inside of the scull, fill it with tow, *slightly* touched with *oil of tar*; for if the tow is saturated with it, oil of tar being of a nature so extremely penetrating, it will come through the skin, and infallibly spoil the specimen. Considerable discretion is necessary in using this most excellent preservative,† and the quantity is to be

* Waterton.

† I may observe, that oil of tar has been used for several years in the Manchester Museum with great success, and I cannot point out any other compound so effective as a preservative. Dr. Hancock, however, has published some observations on the preservation of dead bodies, or of animal and vegetable substances in general, in which he recommends the following compound:—"Take of rock salt (sal gem), nitrate of potash, each eight ounces, dissolve these together in a super-saturated solution of chloride of lime (as much as required to dissolve salts), then add muriate of mercury and tart. of ant., each one ounce, and some muriatic acid to dissolve any excess of lime. A glass or glazed earthen vessel should be employed for the solution, the operator being cautious not to inhale too frequently the pungent fumes which will be evolved.

"This compound injection," observes Dr. Hancock, "will not only prevent corruption in any animal body, but will also preserve its shape and contour, and that even when the solution is much diluted. This method may be used with great advantage in preserving animals for cabinets of natural history. The body being impregnated by injecting all the cavities, as those of the thorax and abdomen (by inserting a tube through a small

according to the size of the very cautious in returning the ıgh the inverted skin, for this ;reat delicacy of hand. You rub the inside of the skin with ıich soaks up the grease, and ou the better to remove any ıf fat that may adhere. You clear away all flesh from the int of the wing, tie a thread to f it, and in the place of flesh tow, first laying oil of tar over with a camel hair pencil. wings are thus prepared, fasten he threads you have attached s of the bones. This both sup- wings, and confines the back prevent its being too much in stuffing. The thigh bones cleansed and wrapped in the ıner as the wings as far as the)u have now only to remove rom the root of the tail, which ı oil of tar, and take away the :he oil-gland. The process of is now finished, and all the :otton may be removed.

Vhen the skin has been thus the next thing is to form the ıe bird. The thickness of the :h passes through the body determined by the size of the and must be just long enough through the skull and rump. is to be wrapped with tow in er of a cotton-spinner's bobbin, ng at the nape of the neck. o or three layers have been und the wire, dip your camel- il in the oil of tar, and damp ow, taking great care not to put uch. This must be repeated th or fifth layer, until the body assume its proper shape and eed scarcely add, that the neck, ıs it has attained the proper must be wrapped no more. y ought to be full at the , gradually diminishing towards When introducing the artificial the skin, bend the wire a little : the skin being overstretched; s the wire (which must be sharpened at both ends) through the skull and rump. Sometimes it is made to pass through the nostril; but this is objectionable, because the wire is visible —in the other method it is concealed by the head feathers.

After the false body has been inserted, and the skin drawn over it, fill up all crevices, and round the back with a little tow, if the specimen upon which you are operating requires it. Some birds have straight backs, but most commonly they are curved. You now sew up the incision that has been made in the skin, and stroke the feathers over it. Wire must then be put through the bottom of the feet, which, passing up the leg, enters the body, and is made firm by being forced into the wrapped part of the body. I must warn you not to place the legs of the bird too near the tail, for this is a very common defect in specimens preserved by unpractised artists. Of course I do not include those specimens whose legs are naturally placed far back, such as the puffin or diver, &c., but your own observation must in this particular be your guide. As much of the beauty and animation of a specimen depends upon the eye, be particular in having the orbit, and small feathers which surround it, perfectly smooth. Some curators insert the glass eyes into the skull through the mandibles; but in my opinion it is preferable, because equally good and less difficult, to introduce them through the orbit of the eye, the skin which surrounds it being capable of much greater distension after death than could possibly be supposed by examining the mere body of the eye during life. If you desire to contract the orbit, it may be done by passing a delicate needle and thread through that part of it which is most remote from the beak. The glass eyes now most commonly used, are those which, being flattened at the back, admit of being painted according to the exact tints of nature. This cannot be done when the eye is formed of differently coloured glasses, attached at the back to a piece of wire. The first mentioned are therefore greatly preferable. It is necessary, in order to prevent the bright colour of the beaks of some species of birds (as for instance, ducks, toucans, &c.) from fading, to prepare them in a peculiar manner. On this subject I

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ade with a lancet), the stomach also, es, trachea, the nose, and injecting the :h the tube of a slender curved trocar, ɔugh the orbit,—it may be requisite, at ıvelope the *limbs, or whole body*, for *with cloths moistened with* the solution, *h immersed in the same.*"

cannot do better than refer you to Mr. Waterton's book, pp. 122, 123.

The bird is now ready to be braced. "The attitudes and actions of birds," says Mr. Ruckahn, (see 'Philosophical Transactions,' Ab. vol. xiii.) are by much the most ingenious and entertaining part of the study; the rest is merely mechanical, but this admits of fancy, taste, and judgment. Attitudes most expressive of the particular qualities of each bird ought to be chosen, as strength and courage in eagles and hawks. In mounting birds of prey some attention should be paid to the part at which they begin to devour their prey. Some begin at the breast, some at the head, some at the back, and others extract the entrails first. The terror of the prostrate bird and the exulting triumph of the victorious, if properly managed, create a fine contrast."

When you have determined in what attitude you will fix the bird, fasten the wire, which runs up the legs, either on a stand or bough; then pass a wire (previously heated in the fire to take off its elasticity) under the wings—by bending this wire you can form the wings to any attitude you please. Then turn the head and neck so as to be in perfect unison. This done, brace the bird with thread to make the feathers lie smooth, for, as the skin shrinks, they have a tendency to rise; but by no means draw the thread too tight, as this will give the specimen a *pinched* and ugly appearance. In order to keep the beak close whilst the specimen is being dried touch the tip of the beak with bees' wax.

These are all the observations I shall now venture to make on the present subject; I shall only add, that I hope you will persevere, however unsuccessful your first attempts may be.

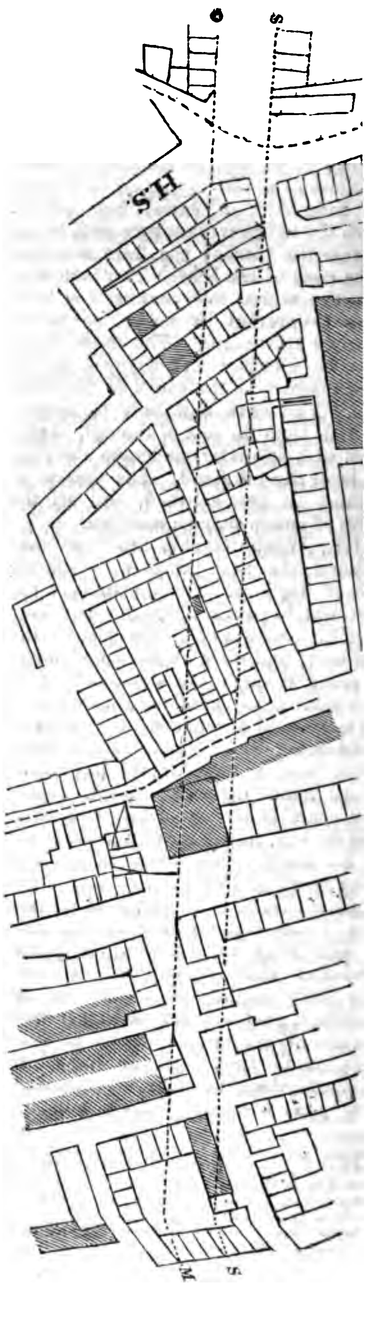
S. M.

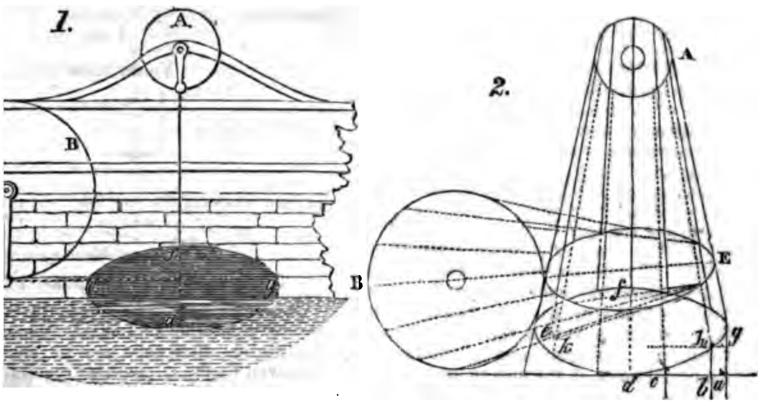
Ashton upon Ribble, June 7, 1833.

NEW STREET FROM OXFORD-STREET TO HOLBORN.

Sir,—I send you a plan of part of the alteration proposed by C. D. S. in the Mech. Mag. 13th vol. p. 21, and again noticed by him at p. 318. It is for a new street from Oxford-street (OS) to Holborn, by Museum-street (MS), and thus avoiding the detour by High-street, St. Giles's (HS). That it would be a great improvement, any one who glances his eye at the map of London will readily admit. The difficulty is how to accomplish it? That I leave to those who m[ay] feel an interest in the matter.—S. D.

Plan.





THREE THROW PADDLE WHEELS.

—The "Athenæum" of April 20, contains an account of a paddle invented by Mr. Grant, of the Clarence Yard, Gosport, which is y recommended for its simplicity, ie scientific principles upon which constructed. It consists of two throw cranks, driven by a centre wo spur wheels, and the cranks otion to three paddles, which are sively brought into full action. In it is similar to Stevens's paddle which was brought forward a few ince, and described in your Journal 'ol. p. 249; but instead of the the paddle rods acting in the manner (with a bridle rod), they nected with a three throw crank, they enter and emerge from the in a nearly perpendicular position. ut five years since I made a model I have still by me) upon the rinciple as that announced in the næum," and like most schemers ghly delighted with my bantling time, but soon laid it aside. A ime afterwards I saw the model of s's paddle at the National Re- y, Charing Cross. This, as you ippose, set me to work again. I nced the necessary calculation working drawing, and had made rable progress, when a remark d by a mechanical acquaintance the detection of what I considered so great a practical difficulty, that n *laid it aside. The announce*ment of the scheme in the "Athenæum," as a great practical improvement upon the paddle wheels at present in use, has induced me to send you a few remarks upon it, and if they should tend to such an improvement or modification of the principle as to render it practically applicable to steam vessels I shall be highly gratified.

The principle upon which it is constructed causes the paddle to travel in an elliptic path, more or less elongated in proportion to the ratio which the centres, the radii of the cranks, and their connecting rods bear to each other. The figure may be formed with one side flatter than the other, by altering the relative position of the centre of the drawing crank with its point of connexion with the paddle rod. The practical difficulty is this:—To regulate the motion of the paddle in such a manner that, when entering or emerging from the water, it shall have an horizontal velocity, at least *equal to the greatest speed* of the boat, and yet that *(at the middle of its stroke) the velocity of the paddle through the water shall not be more than* $1\frac{1}{2}$ *times that of the vessel.* Mr. Smeaton has shewn that the maximum effect of a water wheel is produced when its velocity is about $\frac{2}{5}$ that of the current; and with steam-boats it will be found that their greatest speed does not exceed $\frac{2}{3}$ that of their paddle wheels under the most favourable circumstances. It is evident that no adequate advantage will

be derived from giving the paddles a greater velocity, but that a great waste of power will be occasioned.

A reference to the accompanying diagrams (1 and 2,) will shew that the velocity of the paddle is constantly varying in different parts of its course, and that the horizontal distance passed through, whilst the paddle is moving from g to h, is but about $\frac{1}{2}$ of that from c to d, which is to be performed in the same time. Therefore if the paddle travels at its proper and most effective velocity from c to d, it will, when entering the water and passing from g to h, travel at but little more than half the speed of the boat, and of course will retard its progress through the water, both entering and emerging from the fluid. If h be assumed as the point where the paddle enters the water, the paddle would travel to c before it would begin to have any important effect in propelling the vessel.

Figures 1 and 2 shew the different forms of the path of the paddle, produced by varying the relative position of the three points of motion, viz. the centres of the two cranks, and the connexion of the lifting and drawing rods. The best position seems to be that the centre of B should be perpendicular to the point of connexion of the two rods. The greater the difference in the radii of the cranks, and the less the distance from A to i, the more elongated will be the figure described by the paddle; but it enters and emerges from the water more obliquely. It has also occurred to me that, from the varying amount of resistance, these paddles will be liable to make the engine work unpleasantly. The line from h to the second division beyond p (fig. 2,) is the space between each paddle, if three are made use of. When one paddle is at h, and the other at k, little or no resistance could be experienced by the engine. Perhaps more than three could be introduced, and such a motion given to B as to equalise the horizontal spaces passed through in the same times by the paddles.

I have stated the difficulties which, in my humble judgment, will prevent the useful adoption of the plan in its present form, and should feel most happy to learn that they are either removed, or found to be so unimportant that the scheme is in course of successful prosecution.

I am, Sir,

Yours respectfully,

GEORGE BAYLEY.

June 17, 1833.

BRITISH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

Third Annual Meeting.

Cambridge, 24th—29th June, 1833.

Whatever doubts may have been entertained as to the success of this excellent Institution, they must now be completely removed by the triumphant results of this, its third anniversary.

The number of members at the commencement of the present meeting was 680, but before it broke up no less than 689 new members were added, making the total number at this time 1369. The receipts from admission-fees, &c., have amounted to 1430*l.*, the disbursements to 186*l.* 4*s.* 4*d.*, leaving a balance in hand of 1243*l.* 15*s.* 8*d.* About 1000*l.* more remains to be received; and it is calculated that, after paying all outstanding claims, there will be a clear residue of about 2000*l.*

Dr. Buckland, of Oxford, the President of last year's meeting, opened the present by a brief address, in which, after taking a rapid survey of the progress of the Association, he thus introduced his successor in the chair to the notice of the assembly:—

"My remaining task is short, and would, indeed, be painful, were it not that, on retiring to the ranks from which I have by your favour been for a while promoted, I have the high gratification to resign my office to my friend and fellow-labourer in the same department of science—to my colleague and brother Professor in a sister University, Professor Sedgwick—an University which has ever been the nursing-mother of literature and science—an University which has cherished in her bosom a Bacon and a Newton, and which now holds out to us the right hand of fellowship, to receive with fraternal affection, and in splendid hospitality, the assembled members of the British Association for the advancement of science."

Professor Sedgwick, on taking the chair, begged, in the name of the University of Cambridge, to offer its most cordial welcome to the Association. Dr. Buckland had alluded to the glorious names of Bacon and Newton. He should speak of such names with regret if he believed that their spirits had passed over the land and left no trace behind—if this University were only to be regarded as the tomb in which such men had been buried. But when he looked at those by whom he was

surrounded (Professors Airy, Babbage, &c.) he had the pleasure of reflecting that it could at the present day boast of men in every sense worthy of wearing the mantle of Newton—men gifted with the highest talents—at once the ornaments and benefactors of the age in which they lived. The authorities of the University had been anxiously desirous of doing every thing in their power to promote the admirable objects of the Association. The Senate House would be given up for their general meetings, and the sectional and other meetings would be accommodated in the Halls and Schools of the different Colleges. There would also be a Special Congregation held for the purpose of conferring degrees on such individuals present as were entitled to them by the statutes of the University, and might choose to avail themselves of this opportunity of obtaining them; although he regretted to say, it would not be in their power to imitate the excellent example set by the University of Oxford last year, when they conferred honorary degrees on four of the most distinguished members of the Association. The University of Cambridge had not the power of conferring purely honorary degrees, unless on a mandamus from the King. But though they had received no royal mandate to confer University honours on any of the eminent individuals present, he had a mark of royal favour to announce, which would by some perhaps be thought of scarcely inferior value.and which he was sure would rejoice the heart of every true lover of science. There was a philosopher present amongst them, whose hair was blanched by time, but possessing an intellect which was still in its highest vigour, whose whole life had been devoted to the investigation of truth—he meant his illustrious friend, Dr. Dalton. Without the advantage of the powerful apparatus possessed by many individuals for making experiments—with means,indeed,which were altogether of a most limited description—he had gone on steadily in a course of philosophical study till he had obtained for himself a reputation in those branches of science which he particularly cultivated, not perhaps equalled by that of any other living philosopher. He had now the high satisfaction to announce, that his Majesty and his Majesty's Government, wishing to manifest their attachment to science, and to confer some mark of royal favour on one of its most successful cultivators, had conferred on Dr. Dalton a pension of 150*l.* per annum. (Great applause.)

To detail in regular sequence the remainder of the proceedings of the present Meeting would extend this Report unnecessarily to an inconvenient length; but the reader will find in the following classified arrangement of the papers read, lectures delivered, &c., a notice of every thing important that was transacted during the week.

PAPERS READ.

Department of Mathematical and General Physics.

Remarks on certain Atmospheric Phenomena, observed at Hull in March and April, 1833. By G. H. Fielding, Esq.

Observations on Naval Architecture. By J. Owen, Esq

On the Action of the Glass of Antimony on Light. By Mr. R. Potter, jun.

Account of a Barometer Cistern. By Mr. Newman.

On the Compressibility of Water. By Professor Oersted.

On the Magnetic Force. By Mr. Christie.

On the Strength of Materials. By Mr. Barlow.

On the Theory of Fluids. By Mr. Challis.

General Report on the Progress of this Department of Science. By the Rev. G. Peacock.

Chemistry and Mineralogy.

Account of some Experiments relating to Isomorphism. By Dr. Turner and Professor Miller.

On the Nature and Quantity of the Gases evolved from the Surface of certain Thermal Springs.

On the Specific Gravity of Gases. By Dr. Dalton and Dr. Prout.

An Account of some Experiments on Atomic Weights. By Dr. Turner.

Memoir on the Action of Light on Plants, and on the Action of Plants on the Atmosphere. By Dr. Daubeny.

General Report. By Dr. Dalton.

Geology and Geography.

Report on Mines. By Mr. John Taylor, accompanied by sections of the shafts of some of the deepest in Cornwall.

Description of some Specimens of Ceprolites and Fossil Fish. By Mr. W. C. Trevelyan.

Ordnance Maps of the counties of Salop, Hereford, Radnor, Brecon, and Carmarthen, geologically coloured by Mr. Greenough, accompanied by enlarged sections.

General Report. By Mr. Greenough.

Natural History.

Observations on the Structure and Functions of Spiders. By Mr. Blackwell.

On the Pith of Plants. By Professor Burnet.

On Genera and Sub-Genera. By Mr. Jenyns.

On the Water contained in Bivalve Shells. By Mr. J. E. Gray.

On the Classification of Ruminating Animals. By Mr. Ogilby.

General Report. By the Rev. W. L. P. Garnons.

Anatomy and Medicine.

Observations on the Structure and Functions of the Nervous System. By Dr. Macartney of Dublin.

On the Mechanical Functions of the Urethra. By Mr. H. Earle.

Illustrations of the Effects of certain Poisons on Mucous Surfaces.

General Report. By Dr. Haviland.

Lectures Delivered.

On Mines. By Mr. John Taylor.

Mr. Taylor went largely into the history of mines, and the different theories of their origin which have been propounded by philosophers. According to one theory, metallic veins were originally open fissures, caused by some eruption, and afterwards filled up by aqueous solutions from above; according to another, the filling up was from below, the metallic matter being thrown up by an internal fire; while a third theory supposes the formation of the metallic veins to have been contemporaneous with the rocks themselves. After the delivery of the lecture it became the subject of an animated discussion, in which Dr. Buckland, Professor Whewell, Dr. Boose, Mr. Phillips of York, and Mr. Fox of Durham, took part.

On the Tides. By Professor Whewell.

On Railways and Locomotive Carriages. By Professor Farish.

In the course of the lecture the Professor expressed his conviction that the usual average rate of travelling on the Liverpool and Manchester line—namely twenty miles—might be doubled with the greatest ease and safety.

On Botany. By Professor Lindley.

On Mathematics. By Rev. G. Peacock.

On Hydraulics. By Professor Rennie.

At the final close of the meeting the Chairman announced, that it had been resolved the Association should meet next year at Edinburgh, some time in September, and that Lieut.-General Sir Thomas Brisbane, the President of the Royal Society of Edinburgh, would officiate as *President*, and Sir David Brewster as Vice President. He also stated, that in pursuance of recommendations received from the different Sectional Committees, the General Committee had agreed to appropriate out of their funds a sum of money, not exceeding 600*l.*, to the assistance of persons engaged in such scientific works as they shall deem worthy of patronage.

MODERN PHILOSOPHISING.—REPLY OF JUNIUS REDIVIVUS TO MR. CHEVERTON.

Sir,—It is of course with feelings of profound humility and sentiments of deep gratitude that I venture to approach the subject of the last letter of Mr. Cheverton, whose almost parental kindness to me, and painful anxiety for my literary welfare, make me doubly sensible of the loss I shall sustain should his avocations prevent him from continuing the subject, after the glimpse he has given me of the invaluable nature of his literary and scientific guardianship. As he truly observes, I am at best but an *advocate*, and far, very far from being a *lawyer;* but, as to my "skill," alas! I feel humbled in the very dust when I look upon mine own inutilities, and compare them—no, not compare, that were too presumptuous,—but examine them in the same light with the infinite superiority of Mr. Cheverton, to whom all unprejudiced observers must award the unqualified praise of being a consummate "lawyer," even if the "limited vision of men of single views" should prompt them to question the depth of his philosophy as to questions of "physical, moral, and economical science." Mr. Cheverton proclaims himself to be of the school of the *juste milieu.* No person amenable to reason can doubt it, or the true philosophy of the school. What can be more rational, what more conclusive? If two sets of persons hold opinions diametrically opposite, is it not a *prima facie* evidence that they are both in extremes,—that neither can by possibility be right? What mode, then, can be so philosophical, so simple, and so satisfactory to all parties as to take for truth the mean of all the oscillations, and thus, in addition, save the expenditure of original thinking. "Rules," says Mr. Cheverton, "should bend to the emergency of things." This is precisely the doctrine laid down in the Edinburgh Review. "For a public life

to be useful, it must be one of expedients." The philanthropic kindness of Mr. Cheverton, shown to an entire stranger in my case, can only be compared with that shown by a late Edinburgh reviewer to Miss Martineau, and would almost tempt me to believe that the Edinburgh reviewer and Mr. Cheverton are one and the same person. The former has kindly undertaken to correct the crude opinions of Miss Martineau; the latter has done as much by me, and both in an equally disinterested manner. But though I myself cannot doubt the perfect sincerity of Mr. Cheverton, yet still the world is prone to censure, and therefore I could wish that he had foregone something of the extreme frankness of his opening paragraph, and have condescended, purely for the sake of "making rules bend to the emergency of things," to make his language a little less equivocal. I, of course, am bound implicitly to believe that he "doubts not the honesty of my opinions." It were ingratitude to him for all his kindness to entertain any suspicion of his motives; but carpers, who do not so well understand his purity, will be apt to suspect that, in alluding to the Junius of former days, as having "written himself into notice for the purpose of being bought up," he had the intention of insinuating that such was my ultimate object also. But even were such his belief, I see no fault in it. The public have been so often deceived by writers and demagogues that they cannot well be too cautious, and those are their best friends who constantly impress upon them the necessity of trusting no *men* whatever, but of looking only to measures. If my writings have had the effect of "commanding attention," as Mr. Cheverton supposes, the public must certainly be under infinite obligation to him for the patient criticism he has bestowed upon them.

In setting forth my deficiencies Mr. Cheverton has not confined himself to the mere matter of controversy on which we were at issue, but has in his own person set up a standard of opinion as to the qualities of my mind. As he thus takes infinitely higher ground than any I can pretend to occupy,—as he proclaims himself to be of a superior nature, capable of "apportioning, proportioning, balancing, weighing, and estimating," in short, capable of "thoroughly analysing a subject," he must of course dive into the innermost recesses of my mind, see all its hidden workings, scan accurately all its capabilities and incapabilities with the eye of a master, and meanwhile survey the whole with the compassion of benevolence, as though he were a creator, looking down upon mere humanity. Of course I can only bow in silence to his decisions, endeavour to conform to the laws he lays down, and follow "the path he points out" with so much gracious condescension. But as Mr. Cheverton himself more than intimates that I as yet lack the power of judgment for want of his guidance, it can scarcely be supposed that my brain possesses the requisite firmness to distinguish the true from the false amidst the clash of opinions: he must forgive me, therefore, if, when his opinions come in collision with those of other persons directly and specifically at variance with him in other periodicals, I feel a slight hesitation in receiving his dictum as "absolute wisdom." Of course, I cannot presume to set up any opinion of my own in opposition to the opinions of Mr. Cheverton, for to do so were as if the lesser wisdom were to attempt to judge of the greater.

Having referred to the opinions of critics in other periodicals, which are diametrically opposed to those of Mr. Cheverton, he will perhaps object, that it indicates gross vanity on my part,—that I should have left it to others to perform the part of trumpeter in ordinary. To this I can only reply, that scarcely any man is fitted to judge and reason upon the qualities of his own mind. A physician rarely attempts to cure his own body when in ill health. Trying vanity even by the ordinary rules, it would be less seemly and less useful to give my own opinion on the subject of my own mind, than to refer to the opinions of others. And, as Mr. Cheverton has by his fiat sanctioned the supposition that my writings are capable of "commanding attention," I hold my mind in some sort the property of those whose attention my writings may have engaged. Therefore it would be a species of criminality in me to allow the opinion of Mr. Cheverton to go forth without an expressed doubt. I am, of course, aware that the opinion, backed by so respectable a signature, must have more weight than the opinion of any anonymous writer, just as the opinion of a "highly respectable" manufacturer, in a large way of

business, carries more conviction to the minds of the many, than the opinion of one of the mechanics whom he may employ—"a fellow whom nobody knows;" just as the opinion of Henry Brougham on the woolsack might stir, or rather might have stirred, half England, while that of Samuel Downing in the Mech. Mag. might pass unregarded. And doubtless this is a befitting thing: for what would be the use of station, if mind alone were to be paramount? But I would call Mr. Cheverton's attention, with all due respect, to the fact, that corroborated evidence may sometimes weigh even against high authority, and his goodness will, I doubt not, excuse me, when he takes into consideration the imperfection of my judgment, according to his own showing. I have indeed much to "learn," and trust that he will not deny me his teaching in your future pages. As he so clearly comprehends my defects, and believes that I "command attention," it is doubly important that his authority should correct the defects, and that he should show wherein the judgment of the other critics is defective, lest the evil should be multiplied upon other persons. With regard to personal consideration in the matter, I can have none. I repeat I am but a shadow, and the good I may be enabled to do to others is my motive for writing. Personal popularity could scarcely be an inducement to a hermit, when the very gain of it would be a loss; and I cannot but feel grateful to Mr. Cheverton, or any other person, who will save me from the heavy responsibility of being accessory to the spread of ignorance or untruth.

Will Mr. Cheverton now permit me to discuss some portions of his letter in the mode I should have used ere he so kindly opened my eyes to my own ignorant condition, and not my eyes alone, but the eyes of your readers also, which kindness they will questionless duly appreciate.

After disputing some positions of mine, and one especially on the subject of the friction of axles, with which, as he is a "practical" man, he is more likely to be conversant than myself, Mr. Cheverton brings forth his great charge against me,—I am "not conversant with scientific discussion." I at once plead guilty to the charge. I never was acquainted with a man of "science," and do not remember *ever to have* read a scientific book consecutively, and assuredly have never studied one; and if any portion of my writings has given Mr. Cheverton or any one else the impression that I pretended to science in the scholastic meaning of the term, it has been unconsciously on my part. I never intended to represent my amount of knowledge other than the fact, by any device of quackery, and not till Mr. Cheverton brought forward the charge did I contemplate the possibility, that my plain language could warrant any such assumption. To prevent any future mistakes, I assure Mr. Cheverton that I never had that which is commonly understood by the word *education*. I passed some time, it is true, in early youth, at some of those places which are facetiously called "schools," and therein I learned to read, and to write such writing that neither I nor any one else could read, and which might easily have been mistaken for Arabic characters. I also learned to "cipher," and the stupid ignorance of the method of teaching caused the "ciphering" to be accompanied by so much mental and bodily suffering, that to this day it takes me twenty-four hours to screw my courage up to the task of making any calculations. I moreover learned some Latin words, and the Greek alphabet, and was also taught to believe that copying certain lines and figures from one piece of paper to another, was the art of drawing; aye, and have gained prizes for the accuracy of my copies when in some cases I could not tell whether the objects I copied were geometrical or perspective. I also learned what is called geography; that is, I acquired by rote the *names* of certain places on the surface of the earth; but as to all the essentials regarding them I was utterly ignorant. Was I taught any thing else? I forget; but if I was, it made so little impression that the very fact is forgotten. But there was one thing which I learned, and which I was not taught designedly, and which lesson I have never forgotten—that tyrants and sycophants amongst men are formed by the training which they receive as boys in schools. It was a weary life I underwent. I could not be a tyrant, for my nature was not harsh; I could not be a sycophant, for the stern spirit of freedom dwelt within me from the lisping hours of childhood;—the lips of a parent had taught me that the existence of a slave was not worthy the name of life.

That brutal and half-cunning ferocity which it is the custom to designate as *manliness* in boys, chilled my mind, and insufficient food laid in my body the seeds of disease, to produce an abundant after-crop. What could I do but shun the herd of incipient tyrants and slaves, and, in seeking solitude, dive into the recesses of thought? As I grew in years no "learned ease" was mine: harsh necessity was my daily teacher, and deeply were her lessons impressed. The pains I had suffered myself begat in me, even at an early age, the desire of relieving the pains of others labouring under the like inflictions. Is Mr. Cheverton yet satisfied that I make no pretensions to schoastic science? My *education* came in later years, and huge was the hall wherein I pursued my studies. It was the world—not the mere world of a large town, composed of pure artificialities, but the world,—the round world, with its endless combinations of nature and art; its seas, its rivers, and its forests; its broad plains, its giant mountains, and its delicious smiling valleys; its numerous cities, and its barren deserts;—the world was my school-hall, and my books were the men, aye, and the women, and the children, and the things it contained. The civilised man and the savage I carefully studied, and also the still more curious varieties—the civilised savage man and the savage civilised man. Other languages became familiar to me by the lips of my fellows, more than by their written books, and I knew more of things than of the names of things. I could demonstrate shapes and forms in actual matter better than I could describe them. The process might not be so convenient, but it was sure. Four units make up the number of four as certainly as the single cipher which represents it. An Englishman was once endeavouring to convince a Gaucho of the superiority of his country, by stating that meat was roasted by means of a clock. The Gaucho replied, "I roast meat without a clock, and neither result differs—they are both roasted meat."

Thus, in the case of the railway, I had by my own mode of reasoning come to the same conclusion as Mr. Cheverton and several other persons,—that it could not answer the intended purpose, and others besides myself were convinced by the statement. Then, up started Mr. Cheverton to complain that I had not destroyed the fallacy scientifically,—that I had not calculated the exact spot where it lay,—I had not mathematically defined it,—I could not bring witnesses to prove that the brains were out, though nobody doubted that the body was a corpse. The crime I had committed was similar to that of a sportsman, who had shot a partridge on the nest. The bird was down, but it was not fairly killed. Mr. Cheverton says that I have "skilfully omitted what I could not grapple with." That remains to be proved. "Whatever man has done, man may do," was an axiom written over the schoolroom door, and traceable in nature's characters in the books of my great school-hall, and which had more avail in awakening what mind there was within me, than all else beside which was dignified by the name of teaching. The assertion of Mr. Cheverton, even though it be of authority, can scarcely be taken as conclusive evidence of the fact, any more than his own declining to continue this discussion farther, can be assumed as an evidence of his inability so to do. The rules he lays down for "obtaining a clear perception of a subject," are precisely what I should have pursued in an analysis of a material object. Surely it would be no indication of a world-enlightening intellect to transfer the same process—division into parts—to the mathematical signs and demonstrations which might be made to represent that material object in idea; surely I might have arrived at this fact by a simple process of induction, even had the guiding mind of Mr. Cheverton not been present to overshadow and impart strength to me. Even though this process had been lost as a rule, does it not strike Mr. Cheverton that it might be possible to re-discover it?

And, after all, what is this "science" which Mr. Cheverton considers as a mark of "high mind, great range, and large powers of comprehension?" I have frequently heard mathematicians described as very one-sided men; and the very name "exact science" indicates a matter purely of acquirement, and in which people, capable of comprehending the rules laid down, cannot well go wrong, any more than in ordinary arithmetic. There is, in short, no latitude given for the exercise of the judgment, as in moral and economical science. Mr. Cheverton is of that

school of philosophers who deem that the world will go on best under the influence of "good common sense minds." I differ with him, and especially with regard to England at the present time. "Common sense" is in abundance amongst the rulers, but master spirits are lacking—men of powerfoul judgment combined with inflexible resolution. One Hampden, or Turgot, or Mirabeau, were now of more avail than a hundred Humes or Parnells.* It is a greater and more glorious thing to rule over the minds of men than it is to rule over their bodies. It is a more glorious thing to possess the power of making men's minds assimilate for the promotion of human happiness than it is to possess the power of working upon matter for the promotion of mere human convenience. The possessor of the former power may attain the latter, but the possessor of the latter may go on for a whole life without attaining the former. The former is the power of originating, the latter is the power of imitating or tracing by a clue. The former is the power of the creator, the latter of the created; the one is, as it were, an emanation of a divine spirit, the other an ordinary component of humanity. The one is the essential, which distinguishes the human being from the machine; the other is the opening faculty, which likens him to a machine. He who invented numbers was surely a more glorious creature than the man who can only use them. Professor Babbage is of far more importance to the community than his machine, let it calculate ever so truly. To deny this would be to assume that the inventor is of less importance than the workman. In speaking thus of mathematicians, let me not be misunderstood. I mean them no disrespect, neither do I intend to deny that many mathematicians possess philosophical powers in addition. I perfectly acknowledge the value of mathematical science; but I contend that mere mathematicians may be otherwise very inferior men, and that the power of high judgment, without any fixed rules to go by, is a far higher quality than that which may be communicated by one man to another as a matter of routine acquirement. Mr. Cheverton exults over my ignorance of scholastic acquirement. I have never yet needed it; but, if it should become a desirable thing, will he be good enough to inform me what mighty obstacle there is to prevent me, or any other man of ordinary ability, from mastering it? Why, Mr. Downing offers to "make himself master of twelve departments of mathematical and natural philosophy within a year," and Mr. D. is not a man who speaks without a meaning. Mathematical science is, as I take it, a contrivance whereby certain figures and letters and terms are made to represent ideas analogous to actual material forms, in order to shorten the business of discussion, and thus simplify it for the benefit of the initiated. It is a freemasonry of signs and ciphers, of no use but to the initiated, and when one of the initiated wishes to hold communion with the uninitiated, his cipher fails him, and he must use common language. But the *thing* described does not alter its nature, whether described by the one means or the other. A carpenter who frames a roof may, perchance, never have heard mathematics named; but it is no less certain that he possesses mathematical knowledge under another name, just as the *Bourgeois Gentilhomme* of Molière talked prose without knowing it. I have no especial use for mathematics in writing. I write to the people—to the mass of the community—whose unfortunate lot I would fain alleviate by any means in my power, and I write in the language which I conceive they will most readily comprehend. More than once have I seen mechanics, men of sound judgment, on finding mathematical discussions in the "Magazine," turn away in disappointment, and ask, what use they could be of to them, who could get no meaning out of the puzzling combinations of letters and figures? Scientific men are not always aware of the evil they inflict by the use of language which, though familiar to themselves, is occult to the mass of the community.

Will Mr. Cheverton have the goodness to explain how it is that the friction of a railway carriage "diminishes in the proportion in which it ascends a hill, both in respect to the centrifugal force and with regard to the degree of inclination?" I must confess that it seems a paradox to

* In adverting to Mirabeau, let me not be understood as excusing his vices. I allude to his power over the minds of others for the benefit of the community. His vices were detestable, but his patriotism was pure. His power over the minds of other men rendered him a more valuable member of the community than even Turgot, who was immeasurably his superior in moral worth.

me. That the "greatest pressure on the rail will take place at the centre of the undulation" seems clear enough; but how a carriage driven forcibly up hill is to diminish the friction seems difficult to comprehend. If "friction diminishes as the ascent increases," then make the ascent only long enough, and friction will disappear altogether, and perpetual motion will be obtained.. Perhaps Mr. Cheverton will condescend to explain this, and I shall feel obliged to him.

Mr. Cheverton remarks, on Perkins' steam gun, that it is too heavy for use as "flying artillery." I imagine that the inventor never intended it for any purpose but the defence of towns or entrenched camps, or for the purpose of clearing a breach of the enemy, previous to storming. It would be as available as a large mortar, and not more so. Under the same classification would come my "second hand-roundabout-scheme of a steam-engine-air-pump-air-reservoir-air-gun." I think I have summed up Mr. Cheverton's "scientific" description of the offending machine.

I feel obliged to Mr. Cheverton for enlightening me as to the meaning he intended to convey by his Spanish mule illustration. Will he now excuse me for endeavouring to show him that, while he was undermining my defence of the philosophy of the poor muleteer, on the supposition that I had not looked beyond the load with my "limited vision," there was a deeper depth still, into which even his far sight had not penetrated? Will he forgive me if I endeavour to "delve one yard below his mine;" for it is, if I mistake not, the Bard of Avon who says,—

> "Oh! 'tis the sport to have the engineer
> Hoist with his own petard."

Mr. Cheverton says, that all Spanish muleteers do not use the method of riding which he described, "common sense teaching them that it is better, having a choice, to *avoid* an evil, rather than to correct it by stumbling on another." It is clear, then, that he described a peculiar case, and not a class of cases, and the probability is, that the muleteer, not being able to *avoid* the evil, did his best to *modify* it. Spain is proverbially a country of expedients, in which "rules are made to bend to the emergency of things," and, as Mr. Cheverton approves of such a system, he ought not to be too hard on the muleteer. *The muleteer* might know that there were better modes of conveying human flesh along a mountain road, though there happened to be no other within his reach. What are the premises? A muleteer has one mule, and a pack-saddle and panniers are on the animal's back. He has been to a neighbouring town with a load of water-melons, or onions, or flour, or maize, and after disposing of his cargo, sets out on his return. On the road he overtakes one of the "dark glancing daughters" of his village, whom he asks to ride. She complies, and they stow themselves one in each pannier; the weight is unequal, and at the first brook they balance it with stones. Mr Cheverton meets them on the mountain track, and smiles at their want of science, not knowing that they have "made the rule bend to the emergency of things." "Why not ride astride?" he asks. "Because the pack-saddle is inconvenient, and we should have to carry the panniers on our heads." "Why not have two mules; why not have riding-saddles? why not have good roads and wheel carriages?" he might have asked in the same breath. "Because they do not happen to exist, and we must use, in the best way we can, that which we have, until we can be better supplied." Granted that the stone ballast is a clumsy expedient, still it is the best that can be hit upon in the "emergency of things." The adjustment of the carriage-springs by the same method is, it is true, an expedient; but it is better than having the bones made sore by jolting. Self-regulating springs premise an almost total change in the forms of our carriages, and I apprehend that it is worth while to obtain what ease we can, in the very considerable interval which will probably elapse before such an obviously desirable improvement will come to pass. When a boat springs her mast on a trip, we rig an oar in its place, not supposing that it is so sightly or so useful as a regular mast, but that it is better than no mast at all.

If I have been hoaxed regarding the caoutchouc hats prepared by Mr. Andrews, the matter is still eligible for any other manufacturer. Regarding the Berlin castings, I am glad to hear the statements of Mr. Cheverton, which coincide with the opinion I had always entertained, but had no means of verifying. I had heard strange stories about "bog ore," which had a peculiar property of dilating

as it cooled, in opposition to the common contraction which takes place; but it was too marvellous and mysterious for my liking. The public are obliged to Mr. Cheverton for showing that in this, as in other matters, "whatever man has done, man may do."

I remain, Sir, yours, &c.

JUNIUS REDIVIVUS.

June 18, 1833.

EXACTION OF TOLL FROM STEAM CARRIAGES.

Sir,—We have for some time past directed our attention to the making of locomotive machines for common roads, and have succeeded in making a steam drag, on the precise principle of our patent. Having lately manufactured a large press for a gentleman at Dudley, we determined to take it home by steam. When we arrived at the Soho toll-gate, the keeper closed the gate, and demanded *four shillings* for toll, which we think both an enormous and an unwarrantable charge, having understood, from Mr. Gordon, that the Acts of Parliament empowering turnpike-keepers to take toll for steam carriages were repealed last year. If you will have the kindness to inform us, in the next number of your interesting work, whether such Acts have been repealed, or what part of them, it will be of great use to us, as well as many others.

The experiment, we beg leave to add, succeeded beyond our most sanguine expectations. We accomplished nine miles, with a load of twenty-five hundred weight, exclusive of carriage and chains, and five persons, whose united weights amount to not less than seven hundred weight, in two hours and eight minutes; and thirty-eight minutes of this time were occupied in procuring water and adjusting our load, the chains having slipped twice in consequence of going with so heavy a load so fast, there being no springs in the carriage that bore the weight. We returned home, the carriage and seven persons, in one hour and twenty minutes, fifteen of which were occupied in procuring water, no previous arrangement having been made for that purpose.

We are, Sir, your humble servants,
And constant readers,
HEATON, Brothers.

Shadwell-street Mill, Birmingham,
June 29, 1833.

[*The Select Committee* on Steam Carriages, of 1831, reported "that rates of toll have been imposed upon steam carriages, which would prohibit their being used on several lines of road, were such charges permitted to remain unaltered," but they did not recommend a general abolition of such tolls. Neither can we find any trace of any Act having been since passed for the purpose. We have no doubt, therefore, that all tolls which might ever at any time be levied by Act of Parliament on steam carriages are still in force. We suspect, however, that the tollman must in this case have exceeded his authority; for, on referring to the return, appended to the Parliamentary Report before quoted, of "all Turnpike Road Acts" by which tolls are imposed on steam carriages, we find that the only one which relates to Birmingham, is the "Birmingham and Bromsgrove Road Act," and by that Act the toll "for locomotive engines drawing carriages" is only two shillings.]—ED. M. M.

INTERIM NOTICES.

We have received a letter from Mr. Ride, of the Vauxhall Works, Leicester, in reply to that of Mr. T. V. Robson, on Mr. Hall's Steam-Engine Improvements, which we inserted two weeks ago; but as Mr. Ride says he "should not have taken the trouble of replying to it, had it not been for the Editorial note appended to it,"—and as the matter of that Editorial note was fully disposed of in our last Number (published subsequently to the date of Mr. Ride's letter,)—we conclude that the printing of the reply would now be considered by its author superfluous. We do not think that in any point of view it would do either Mr. Ride or his friend Mr. Hall any good.

Mr. Mallet, in reply to ϕ. μ., in our next.

The invitation of Duty D. Dubikins, to pay a visit to his "immortal fine farm" in Connecticut,—is very tempting. Can he stay in the River a week or two longer? And are "wife and weans" included in the invitation?

"A. B. C."—Yes; a desideratum, but not so great as is generally supposed.

S. Y.'s solution of Mr. Ham's Railway Problem is again unavoidably deferred.

We have not been able to meet with the information requested by "Compass."

A Correspondent is desirous of knowing how he could communicate with Mr. Witty, the inventor of the Smoke-Consuming Furnace.

T. M., the inventor of the "Locomotive Machinery Extraordinary," noticed in our last Number, is requested to favour Mr. James Tucker, of 121, Long-Lane, Bermondsey, with his address.

Communications received from Mr. Baddeley—Mr. Dakin—Mr. Shalders—S. D.—Mr. Rutter—Junius Redivivus.

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MR. OGLE'S STEAM CARRIAGE.

Fig. 1.

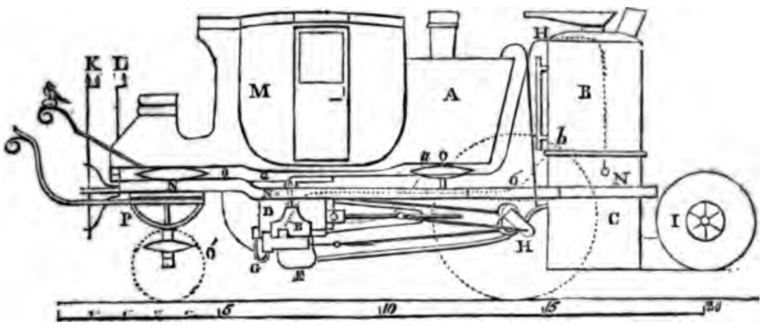
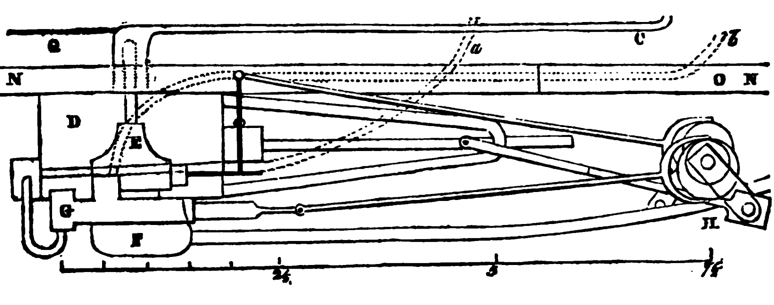


Fig. 2.



MR. OGLE'S STEAM CARRIAGE.

Sir,—Having seen and examined Mr. Ogle's steam carriage, I herewith send you a sketch and description of it, hoping that it will prove interesting to that numerous class of your readers who at the present time are studying the subject of steam locomotion.

I am, Sir,
Your obedient servant,
S. D.

July 6, 1833.

Description.

A the water tank in the hind part of the body of the coach, on the top of which is a seat for the man who attends to the water-pipe, to the safety-valve, and to the filling of the boiler.

B the boiler, on the top of which is a hood or mouth-piece for supplying the furnace with coke, and on the back is fixed a pipe, which I suppose to be the waste pipe. C the furnace, the chimney of which goes out at the top of the boiler. This furnace is attended to by a man who sits on the other side of the bellows, or circular fan, marked I.

D the cylinder. E the steam-box. F the condenser. G the pump. H the crank on the axle of the great wheel. Only one side of the apparatus is shown to avoid confusion. K the handle by which the conductor guides the carriage. This is at the top of a rod which has a ratchet-wheel at the lower end, which moves a semicircular rack attached to the lower carriage P. There is a sight in front, by which the conductor knows the angle he is steering at. L is the rod by which he stops the carriage: it works by a perpetual screw, moving a small wheel attached to a rod, at the other end of which is a lever catching the rod Q.

M is the body of the coach, hung upon the springs O O to the carriage N N N, which itself is hung by the springs O′ O′ to the axles of the wheels. All the machinery is attached to the carriage N N N.

Hence it appears that this carriage is as completely hung upon springs as any carriage that ever was made; the three parts of the contrivance, viz. the wheels, the carriage, (N N N including the boiler and machinery,) and the body M, being perfectly independent of each other in their perpendicular motion.

The action of the machinery will be evident on referring to fig. 2. The water descends from the cistern A by the pipe *a*, to the back of the cylinders, where it branches off right and left to the pumps. The pump G forces it up the pipe, running along by the carriage N N into the boiler at *b*. The steam descends from the further corner of the boiler by the pipe *c* to the top of the cylinders, from whence it branches off to the steam-box E, and having passed through the cylinders into the condenser F, it escapes by pipe *a* into the furnace C, from which pipe another runs to the top of the cistern A. (It should be stated that the pipe *a* is of leather.) The safety-valve is seen at the top of the pipe *c*, but instead of passing into the air the steam passes by it along another pipe into the furnace *c*.

The mechanical movement of the parts is sufficiently evident to any one at all acquainted with machinery.

THE UNDULATING RAILWAY.

Sir,—It must be conceded to Mr. John Ham that, under the circumstances he supposes, a carriage would arrive at B in less time by the undulating line shewn at page 179, than by the straight one, and having done so, perhaps, he will take my word for it that this fact has nothing to do with the subject in dispute.

Let b=length of the base of any inclined plane;
L=length of the inclined plane, raised upon the base b;
n pounds=force of traction on a level at any given velocity.

The pressure against the inclined plane will be to the pressure on the level as $\frac{b}{L}$ is to 1; therefore the force of traction required, in consequence of friction on the inclined plane, will be to the force of traction on the level as $\frac{b}{L}n$ is to n. The entire expenditure of power to move the wheel the horizontal distance b on the level rail will be $b\,n$ pounds, and upon the inclined plane it will be $\frac{b}{L}n \times L = b\,n$ pounds as before.

Now, as this will be true for *all* heights and elevations of the inclined plane L, and as curves may be considered as formed of a number of indefinitely short

inclined planes, it must be equally true of curves; and we are fully justified in concluding, that *the quantity of power required by the friction is the same for the same horizontal distance moved, whether the motion is on the curve or the horizontal rail, provided the velocity is the same in both cases.*

It is possible some advocate of Mr. Badnall's plan may turn round upon us, and say, "We have the authority of the *Scotsman* newspaper for asserting that the expense of power, in consequence of friction, is precisely the same for the same distance moved, let the velocity be what it may; and, therefore, to whatever extent the velocity of the carriage is increased by means of the curve, the expense of power will still be the same, and time will be gained." We will examine the thing even on this supposition.

It is obvious that, in consequence of the curve being longer than the horizontal line, the average velocity on the former must be greater than that on the latter, to move the wheel the same horizontal distance in the same time, and that whatever number of strokes of a steam piston may be required to move the wheel over the horizontal rail, the number required to move it over the curve must be greater. Now if the time in which this greater number of strokes is made can be decreased without disadvantage, we need not apprehend any inconvenience from making the less number of strokes required by the horizontal rail in the same decreased time: therefore here the curve has no advantage. In what, then, shall we seek its superiority? There is certainly this *difference:* on the level rail the tractive force is constant, while on the curve it is continually varying. Need we hesitate as to which will cause least wear and tear of machinery?

I take Mr. Badnall's word as to the importance of his proposition being thoroughly investigated, and I know, both from reason and experience, that nothing is more likely to lead to wrong conclusions than experiments upon what is called a "practical scale." If a machine itself is tried, and found to do its work better than another machine, it seems a sufficient proof that it is constructed upon better principles, and unprofessional persons at once jump to that conclusion; but when a practical man considers the great variety of circumstances which may, separately or combined, occasion the apparent superiority, he will, if he is a just man, be very cautious how he gives a preference. In fact, unless the superiority of a principle can be theoretically proved, it appears to me there is but little reason for *faith* in its superiority, in consequence of the results of experiments made with a complicated apparatus. I could name more instances than one in which engineers of acknowledged talent and experience have formed hasty opinions upon experiments, of which a little time has proved the fallacy. If the engineers of the London and Birmingham Railway should happen to do the same it will be rather a serious business for the shareholders.

Yours, &c. &c.

S. Y., an Engineer.

16, Lambeth Terrace,
June 20, 1833.

In my last, page 181, for 8 read .8.

ST. SWITHIN'S DAY.

Sir,—St. Swithin's Day is fast approaching, and as there are a great many persons in this country who still think it worth their while to watch for the coming of rain on that day, perhaps you will permit me to apprise them of the error which our Almanac-makers have led them into respecting the proper day for them to set apart for their observations.

As long as the Saints' days are retained in the Calendar, they might as well be put in their proper places; and a little reflection would enable most persons to see through the absurdity of continuing to write the words "*St. Swithin*" on the 15th of July, now that the style is altered; and, with the aid of a small portion of common sense, they would be able to detect the error of those writers who assert that a difference of twelve days should be made. To convince them of the latter error, let us suppose that the style had been altered just previous to the Saint's death, in the year 868, in which case *four* days only would have been taken from the Calendar instead of *eleven*, as was rendered necessary by delaying the alteration till the 18th century. If this had been done, that identical day, which was called the 15th of July by the good people of Canterbury, would have been entered in their Chronicles as the 19th; consequently, the 19th of July is the true

St. Swithin's Day, and ought to be marked as such in our Almanacs.

What is the use of commemorating any event if we do not select for our purpose that particular part of the year on which the event actually took place. The event we are speaking of, took place just 27 days after the longest day; and we fix it upon the 23d. Or, to put it in another shape, the sun was in that part of the heavens in which we annually observe it to be now, 27 days after the longest day; and, surely, in a case like this, we ought to pay some respect to the relative positions of the sun and earth. If our ancestors erroneously called that day the 15th of July, that is no reason why we should call it so now. The fault lay with their defective mode of calculating time; but we have a better mode, and should act up to it in all things.

Let it not be supposed that I would apply the same measure of four days to all cases. No; those Saints who were canonised before the observance of the old style had led to error, should retain their wonted places in the Calendar (if there at all); and those who were canonised since, should travel the exact number of days that marks the extent of the error.

I am, Sir, your obedient servant,

J. C.

MORE POTTERY SECRETS.

Sir,—Your readers will probably be further gratified by the following *secrets of pottery*, in addition to the former.

Yours, &c. FRIAR BACON.

Hulton Abbey, Burslem.

CHALK BODIES.

(On a Plaster Kiln.)

Nos.	1	2	3	4
Blue Clay	24	24	29	27
China do.	24	24	29	27
Flint	50	52	42	44
C. Stone	2	—	—	2

No. 4 is J. C.'s.

No. 5.

Blue Clay	27
Moor do.	33
Raw Flint	33
Smalts	1 oz.
Enamel	2

No. 6.

Blue Clay	36
Moor do.	40
Raw pulverised Flint	24=100
Smalts	4 dr.

No. 7.

Cr. Col. Slip.	50
China Clay do	24
Flint do.	26=100

No. 8.

Cambria Clay	60
Do. Wh. Stone	20
Flint	20=100

No. 9 (Lakin's).

Blue Clay	26
Glass	26
Flint	6
Lynn Sand	26
Bone	6
Plaster	5
Enamel	5=100

No. 10.
With Cambria Clay.

Blue Clay	55	Slip
China do.	14	—
Cambria do.	17	—
Flint	11	—
C. Stone	3=100	

Takes a hard fire.

CHALKY GLAZES.

Fritts.

Nos.	1	2	3	4	5	6	7	8	9	10	11	12	13
Glass	—	20	50	10	8	6	—	11	20	8	8	2	2
C. Stone	52	—	—	15	8	12	34	22	—	—	—	—	—
Flint	16	6	—	5	46	25	18	38	—	—	—	1¼	4
Borax	32	1	—	3	—	—	25	9	20	—	—	—	—
Nitre	—	4	1	5 Salt	—	—	—	—	1	½	—	—	—
R. Lead	—	—	3	5	—	—	15	10	—	1	1	—	—
Arsenic	—	—	1	—	—	—	—	—	1	1	—	—	—
Potash	—	—	2	—	8	6	—	—	—	—	—	1	⅓
B. Calx	—	5	1	—	—	—	58	—	—	—	—	—	—
Bone	—	—	—	—	15	45	—	—	—	—	—	1	½
Lynn Sand	—	—	—	—	15	6	—	—	—	—	—	1½	—
Tin Ash	—	—	—	—	—	—	4	1	—	—	1	—	—
Soda	—	—	—	2	—	—	4	—	—	—	—	—	—

Glazes.

Nos.	1	2	3	4	5	6	7	8
Fritt, No. 4	12	9	60	60	40	60	20	—
C. Stone	24	28	—	—	—	4	20	—
Flint	6	5	11	11	12	6	10	—
W. Lead	50	58	29	29	45	30	50	—
Glass	8	—	—	—	3	—	—	—
Fritt, No. 9	—	—	—	—	—	—	—	40
W. Lead	—	—	—	—	—	—	—	40
C. Stone	—	—	—	—	—	—	—	20

(To be continued.)

FORMULA FOR THE DETERMINATION OF THE VALUE OF ANNUITIES.

Sir,—I do not know whether I have any title to claim the original invention of the subjoined formulæ for the determination of the value of annuities, but as it is so simple and expeditious that when applied to short periods it even rivals the logarithmic formula in general use in these respects, I cannot suppose it would have been entirely superseded by it had it been generally known; but as such calculations must have been familiar to many arithmeticians before the invention of logarithms, I should not be surprised that the formula as I give it, or some modification of it, were known by some of those who are curious in such matters. This, however, is of little consequence. I discovered it accidentally upon an occasion of being called upon to make a few calculations of the kind without means of access to logarithmic tables; and as some of your readers may at times be similarly circumstanced, you may perhaps not consider it unworthy of insertion in your Journal.

The formula is as follows:—

$$an-\frac{n+1}{2}x\,A+\frac{n+2}{3}x\,B-\frac{n+3}{4}x\,C+\frac{n+4}{5}x\,D-\frac{n+5}{6}x\,E,\ \&c.=v,$$ where $a=$ the annuity, $x=$ the interest of £1 for one year, $n=$ the number of years the annuity continues, $v=$ the present value required, and the capitals A, B, C, &c. $=$ the value of the term of the series immediately preceding that in which they respectively occur.

Its construction is very simple. If we put $r=1+x$, or £1, with a year's interest added, it is well known that $\frac{r^n-1}{r-1}a=$ the amount of the annuity, which $\div r^n=v$; if, then, we substitute $1+x$ for r, this expression will stand $\frac{(1+x)^2-1}{(1+x)^{n+1}-(1+x)^n}=v$, the division of which will present an infinite series, from which the formula is deduced by the simple process of dividing each term into the one immediately following it.

An example will show the rapidity with which the series converges. Let it, then, be required to determine the present value of an annuity of £5, to continue 10 years' interest of money being 5 per cent. per annum:—

$$\begin{array}{lclclclcll}
na\ \ldots\ldots & & & = & 50\cdot & = & A & = & 50\cdot & \\
-\ \frac{n+1}{2}x & = & \frac{11}{40} & = & 13\cdot75 & = & B & & & =\ 13\cdot75\\
+\ \frac{n+2}{3}x & = & \frac{12}{60} & = & 2\cdot75 & = & C & = & 2\cdot75 & \\
-\ \frac{n+3}{4}x & = & \frac{13}{80} & = & 447 & = & D & & & =\ 447\\
+\ \frac{n+4}{5}x & = & \frac{14}{100} & = & 063 & = & E & = & 063 & \\
-\ \frac{n+5}{6}x & = & \frac{15}{120} & = & 008 & = & F & = & & =\ 008\\
 & & & & & & \text{Sum} & & 52\cdot813 & \ \ 14\cdot205 \text{ or}
\end{array}$$

£38·608 or £38 12*s.* 2*d.* $=v$, the present value required.

If the annuity were greater, or if the period of its continuance were prolonged, it would be necessary to collect a few more terms of the series; but the operation, as will be seen, is extremely simple.

I am, Sir, &c.,

F.

[*The preceding formula is* perfectly correct; but, as the author seems to be aware

could only be employed with advantage for very short periods. When n is a small number the series will converge with considerable rapidity; but when otherwise, as, for instance, when $n = 50$, the series will diverge, and consequently be of no use.—Ed. M. M.]

IRON AND STEEL MANUFACTURE.

This volume of Dr. Lardner's Cyclopædia* is of a more discursive, and, perhaps, of a more entertaining character than its predecessor on the same subject, which we noticed some months ago, not without commendation of its merits, but at the same time not without some censure of the unseemly haste with which it appeared to have been put together. The present one is altogether of a lighter cast, as though the author, having already got through the "heavy business," now felt himself quite at ease, and ran on from chapter to chapter without caring much for method or connexion, but just as it jumped with his humour at the moment. The result is the production of a *tome* far less solid and serious than might be looked for on so staid a subject in so staid a work as an Encyclopædia, but yet containing a considerable quantity of valuable information, mixed up with enough of pleasant anecdote and light remark to make it acceptable almost even to the admirers of "light reading." Of variety there is surely quite sufficient; for although our author sticks pretty closely to his text, the articles of Iron and Steel Manufacture are so numerous, and of so widely different a nature, that it costs him little trouble to avoid all danger of being charged with monotony. From swords and pistols to pins and needles is but a hop—a step carries him from steel pens to heavy artillery — and from fire-arms to fire-irons is fairly cleared in a single jump! His subject is a perfect "universal joint," which he can turn any way at pleasure. After "swords" and "knives" are disposed of (not without some display of antiquarian research), a considerable number of pages is devoted to the important head of "razors," containing a good deal of *cutting* remark. Next follows "scissors," also a *sharp* and clever article, from which we have marked for extract the description of the numerous processes necessarily undergone by a pair of those useful and apparently simple little instruments :—

"The following enumeration of the processes through which a pair of polished scissors, sold at the shops for about half-a-crown, generally pass, will convey a tolerable idea of the ordinary course of manufacture. The blade is forged at the anvil out of a bar of steel of the proper size, from which it is presently cut with a chisel, along with so much of the metal as will be required for the formation of the shank and bow. A hole is then punched through the *mould*, as the rough blade is called, sufficient to admit the point of a little beaked anvil, called a beck-iron, and placed on the stithy. Upon this the bow is formed by a process of hammering, the tediousness of which is occasionally much aggravated by the tendency to break open which bad steel exhibits when so elaborately wrought from the fire. The article being thus fashioned so far with the hammer, is, in the next place, put into the fire in little bundles, to be *lighted* or softened. It is then taken to the filer, by whom the shank and bows are more perfectly fashioned, and the joint squared; he likewise bores the pin-hole, and fits it for the reception of the screw. In this state the scissors first go to the grinder, who shapes the blades on the stone, an operation requiring peculiar dexterity on the part of the workman, in consequence of that nice flexure of surface which every scissor-blade exhibits. They are then put into the hands of women, and by them the bows, the beaded and otherwise ornamental work, are smooth-filed and rough-burnished, or got up by means of a stick with fine emery and oil. Being returned to the workboard they are put together by insertion of a screw, and made, as the workmen term it, to *walk* and *talk* well; that is, by so setting the blades that they shall move more smoothly against one another. In this state they are wrapped from the points upwards to the bows with fine iron wire, the screw is taken out, and the blades and shanks hardened by the usual process. When stripped of the wire they are again sent to the grinder, from whom they now receive their perfect shape; are returned to the workman, who inserts the screw, and makes the scissors to fit,

* *A Treatise on the Progressive Improvement and Present State of the Manufactures in Metal. Vol. II. Iron and Steel.* London: 1833. Longman and Co. pp. 362.

work, and set perfectly. Indeed they are never better for use than after this last operation. The bows and other parts, having become black during the hardening, are again rubbed bright by means of fine flour-emery and oil, and the scissors are sent, for the third time, to the grinding-wheel, where the shanks are ground as they may require it, and the whole glazed and polished as perfectly as possible. The putter-together having finished and inserted the screw, and whetted the edges of the blades, his work is done, and the scissors are finally got up by women, who carefully fine-burnish the bows with a polished steel instrument adapted for the purpose."—P. 39.

From scissors we arrive at scythes and sickles, and from these implements of peaceful occupation to their opposites—military weapons, respecting which a good deal of erudition is displayed. We should have been inclined to quote a passage relating to Damascus' blades, but that nothing new is advanced on the subject. We pass on, therefore, to "fire-arms." Here we have a curious calculation:—

"The celerity with which fire-arms were manufactured, and the high prices paid to workmen in periods of excitement and demand, are strikingly illustrative of the perfection to which our countrymen have carried this branch of manufacture. At Birmingham, during the war, it was understood that they made a musket per minute, and the contract price at which they were supplied to the British Government was 36*s*. each A serious reduction, however, took place when peace came, so that the prices paid by the French in the contract above mentioned (1830), and which were considered liberal, were about 28 francs, or nearly 23*s*. each gun. For gun-locks, which towards the beginning of the previous year only 1*s*. 6*d*. each was paid, the manufacturers were glad at the end of 1830 to give 2*s*. 6*d*.

"It appears, on reference to a table in Mr. Parson's pamphlet on the manufacture of fire-arms, that, in the year 1813, there were fabricated at Birmingham, for the Board of Ordnance, not less than 320,643 stand of arms, and in 1812, 288,741."—P. 113.

At present, it appears, in consequence of the decline of the trade, the largest number that Birmingham could supply would be about 200,000, while London could turn out about half as many more—quite enough for any but gluttons at "the game of kings!" Proceed we, by way of contrast, to "Iron Printing Machinery," a head which is treated in a manner commensurate with its importance. This chapter not only contains, in a concise and connected form, a mass of information which was before only to be gained by reference to a great number of periodicals and other fugitive authorities, but corrects many false notions which had long been floating in the public mind as to the inventors of machine printing, and the particular share each subsequent speculator had in the great improvements made since its first introduction:—while König has his due, the efforts of Applegath and Cowper are not passed by without due notice and applause.

Of the remainder of the volume the part devoted to "locks" is the most elaborate and interesting, as we might well expect it to be. The chapter on "Miscellaneous Articles" is, however, not far inferior.

The following we have thought it worth while to quote, as a curious specimen of the *unfeelingness* of trade:—

"Besides the knives commonly used at table, there are others manufactured to a large extent as branches of the general trade, especially shoemakers' knives and bread knives; these have generally common turned light wood handles, more attention being paid to the temper of the blade than to the beauty of the haft. Of these, as well as of table knives in general, an amazing export trade is carried on from this country to the East and West Indies, and especially to America. Large quantities of plantation knives, of the commonest description, are manufactured on the Continent, under the appellation of Dutch knives. In the years 1812, 1813, 1814, until the peace opened the trade with Holland, thousands of casks, full of these "Malay knives," with lignum vitæ handles and cast-iron blades, were made at Sheffield, where the workmen called them *tormentors*, from an idea that they were intended for dirks and scalping-knives."—P. 15.

Nothing comes amiss to the men of metal! They would supply knives to cut their own throats for a con-si-der-a-tion!

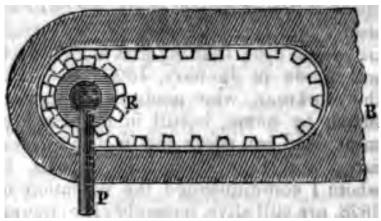
We have been rather astonished to observe Dr. Lardner's announcement in this volume, that a third part of his Cabinet Cyclopædia is now completed. It would have been undoubtedly, by this time, if he had adhered to his original plan, but that has been so continually

enlarged as the work proceeded, that, unless in his forthcoming volumes he should disregard symmetry altogether, and treat his future subjects at a tenth part of the length their importance would demand, taking the already-published parts as a standard, his Cyclopædia will stretch, not three, but thrice these times as far as it has yet extended. He will do well, if none of the Treatises to come are worse than this on "the Iron and Steel Manufacture."

PARALLEL MOTION.

Sir,—I was looking at the parallel motion, described in your Journal of the 9th of June, 1832, which, however, I cannot see to be any parallel motion at all. Will the author say whether he has or not made a mistake in representing his idea, for it is evident that if the groove were straight, instead of circular, it would be a parallel motion, whereas at present the top of the piston rod would move in the arc which the groove forms, instead of moving in a right line, which it ought to do. In the mean time I offer the following plan for the same purpose as the above:—

Fig. 1.



Let a groove be made in end of the beam of the engine, a little longer than the versed sine of the arc which it describes, the end of the piston to work in this having a roller with cogs on the outside to fit in similar cogs made in the groove, as in fig. 1, where B is the beam, P the piston rod, R the roller.

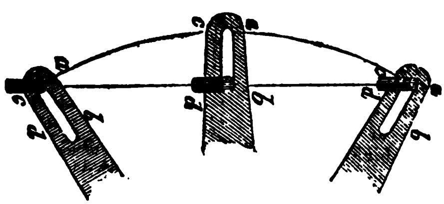


Fig. 2.

The action of this contrivance would be as represented in fig. 2. During the progress of the up stroke the roller on the top of the piston rod would traverse the upper side of the groove from *a* to *b*, and from *b* to *a*. As the beam descends it would run along the under side of the groove from *c* to *d*, and from *d* to *c*.

I do not offer this confidently as a substitute for the parallel motion, but as a suggestion merely, and as such I hope it will be allowed a corner in your Magazine.

S. D.

July 3, 1833.

MR. MALLET'S CONICAL STONE-SPLITTING SCREWS.

Sir,—In the Number of the Mechanics' Magazine for the 11th of May last, I find an anonymous writer, under the signature of φ. μ., rashly accuses me of pirating *his invention* of the principle of stone-splitting screws, &c. I have been *much from home since*, and otherwise engaged, which have prevented my replying sooner.

Granting that φ. μ.'s article of the 3d of September, 1832, and mine on stone-splitting screws, were identical, he has given no proof that I was aware of the existence of his article at all, much less

that I pirated it; and, therefore, I am compelled to say that his charge of piracy is most insolent and vexatious; and I need hardly add, that the inflated style in which it is couched is most preposterous.

Short ceremony is necessary with one who attacks, assassin-like, from under the cover of initial signature; accordingly, until ϕ. μ. favours us with his name and address, I will give no further reply to his accusation than simply to state, *that my invention of conical screws for splitting stones, and for other purposes, was made six years ago;* that my first model screw was made in January, 1828; and that the workman who made it, Abraham Marsh by name, is still in our employment, and can prove the facts if necessary; and that various individuals, to whom I communicated the invention in 1828, are still alive, remember the circumstances, and can corroborate my assertion.

Until the publication of ϕ. μ.'s article of the 11th of May last, I had never seen his article of the 8th of September, 1832, or heard of it, not being a subscriber to the Mechanics' Magazine at that time; and now that I have seen it, I say that essentially mine is a conical screw, in a *cylindrical* nut, applied to an useful purpose, and perfect in all its details. His is a half-digested idea of a conical screw in a *conical* nut, applied to no purpose, or, if to any, to one to which it is thoroughly inapplicable, namely, a micrometer! a micrometer of 20,000 tons power!! and without an uniform motion!!!

I cannot presume to plume myself with ϕ. μ.'s lofty pretensions to inventorship, namely, to be an *inventor of principles;* but I am prepared to maintain that I have been the first to *develop a principle,* and apply it to an useful purpose, for any thing I have yet heard to the contrary.

ϕ. μ. might have brought forward what he conceived a coincidence between his article and mine, and left me to resolve it as I could, but should not have at once launched an unsupported charge of piracy. I might with much more reason now accuse him of endeavouring to appropriate the merits, whatever they may be, of my successful invention to his own inconclusive crudities.

And now, Sir, I consider my reply sufficient for an *incognito,* and more than enough were not my veracity at stake. If ϕ. μ. requires more, *let him tell us who* he is, and I will bring forward abundant proof that my invention was made *six years ago,* and consequently *rather* before he fancied "he had achieved that first-rank honour of breaking down the barriers which imprison us in ignorance, and admitted his new ray of undiscovered knowledge to light us on to more."

I feel assured, Sir, you will insert the above as speedily as possible, and am,

Sir, your very obedient servant,

ROBERT MALLET.

94, Capel-street, Dublin,
July 1, 1833.

[We see no occasion for so much warmth, and must in our own behalf, if not on that of ϕ. μ. enter our protest against the language which M. Mallet has here permitted himself to make use of. He accuses ϕ. μ. of acting in an "assassin-like" manner because he writes anonymously; and, of course, if there be any foundation for this imputation, the Editor cannot be considered guiltless, who held open the door to the assassin. The charge, however, is altogether ridiculous. ϕ. μ. states, that in a certain paper of his which, appeared in the Mechanics' Magazine of a particular date, there was a proposition thrown out which seems to him to have suggested to Mr. Mallet the idea of his stone-splitting screw. Now, what is there "assassin-like" in this? Whether right or wrong in this supposition, there is at least nothing covert or underhand about it; he gives chapter and verse for the suggestion which he supposes to have been borrowed, and leaves the public to judge for themselves. Suppose a real name had been given, how could that affect the suggestion itself? Clearly not at all, since anonymous writers may be as readily pillaged as those who give both name and sirname. We hear anonymous writing frequently spoken of as if there were something abstractly heinous in the act itself; while, in truth, every thing depends on the sort of use to which it is applied. It may be employed for the best as well as the worst purposes; just in the same way as the veil, which is seen at one time shielding virtuous modesty from the noonday gaze of the world, may at another time serve as the crape to the midnight robber. We dare say ϕ. μ. will not be without something to say for himself in return for Mr. Mallet's civility; but, in the mean time, we feel it due to him to say, that he is, to our knowledge, both a scholar and a gentleman, and, as his writings show, not more distinguished for learning than ingenuity. We may add, for Mr. Mallet's particular information, that he is nearer his elbow than he probably imagines.—ED. M. M.]

THE CASE OF COCHRANE AND GALLOWAY v. BRAITHWAITE AND ERICSSON.—NEW TRIAL.*

The readers of the Mechanics' Magazine will doubtless remember, that on a former trial of the matter at issue between the above parties, before Lord Tenterden, on

* The present report, or outline rather, has been drawn up entirely from memory, and can possess, therefore, no pretensions to verbal accuracy. We believe, however, that it will be found to contain a sufficiently faithful account of the substance of the proceedings.

the 6th of July, 1831, the plaintiffs were nonsuited on their own evidence. (See the trial, reported at length in the Mech. Mag. of the 3d and 10th of September, 1831.) In the following Term they obtained a rule for a new trial, and on the 5th inst. this new trial came on at the Guildhall, London, before Lord Chief Justice Denman. A special jury had been summoned for the purpose, but only one special juryman being in attendance, the plaintiffs prayed a *tales*, and the remainder were taken from the common jury list.

Mr. Pollock, Mr. Hill, and Mr. Kelly appeared for the plaintiffs; Sir James Scarlett, Mr. Rotch, and Mr. Follett for the defendants.

The plaintiffs' case having been opened at great length by Mr. Pollock, and in much the same way as on the first trial, the following witnesses were called in their behalf:—Mr. Turrell, mechanical engraver, Dr. Birkbeck, Mr. Timothy Bramah, C. E., Mr. Brunel, sen., and Mr. Partington. These witnesses all swore that the steam-boiler of the defendants was an exact copy of that of the plaintiffs, which they considered to be both a new and useful invention, and that they had seen a boiler constructed in the manner set forth in the plaintiffs' specification in actual and successful operation at Mr. Galloway's manufactory; but, on cross-examination, none of them could say that in the boiler which they saw at work the flue was closed at its extremity (as directed by the plaintiffs' specification), by a valve loaded with a column of water, or some other equivalent weight, or that there was any valve there at all.

Mr. Turrell having had his attention directed by Counsel to the circumstance, that in the defendants' boiler there is no stoppage whatever at the end of the flue, but, on the contrary, an open passage at all times into the atmosphere, replied, that he considered the gradual tapering of the defendants' flue had the same effect in compressing the included air as the loaded valve in the plaintiffs'; and that, *therefore*, the one was clearly an imitation of the other!

Dr. Birkbeck, whose evidence partook more of the character of a popular lecture than of a testimony on oath (for which he was afterwards well *lectured* by Sir James Scarlett,) was asked what he thought of that part of the defendants' specification which provides that an exhausting apparatus may be applied at the termination of the flue for the purpose of quickening the draft, instead of employing a blower at the furnace end.—Whether this was not a *proof that acceleration*, and not *detention*, of *the heated column* was the object of the defendants? The Doctor, in answer, ridiculed the thing exceedingly: the notion of *sucking* out the current of air seemed to him fit to be entertained only by mechanical babes and *sucklings*; he felt quite sure it could never be of any practical utility; and he gave for all this sundry very prettily expressed, if not very philosophical, reasons.

Mr. T. Bramah stated, that he had seen a steam-engine at work at Mr. Braithwaite's manufactory, driving the whole of the machinery of that large establishment, the boiler of which was constructed in exactly the same manner as the plaintiffs'. He was asked if he had *seen* the interior of the boiler he alluded to? He answered he had not? On which came the natural rejoinder, "If you did not see the interior, how can you tell whether it is like the plaintiffs' or not?" After considering a *little*, as if puzzled a *good deal*, the witness replied, that he had seen the *termination* of the defendants' flue, which was *very small*. Mr. Rotch on this very shrewdly observed, "But you know, Mr. Bramah, smallness and largeness are merely relative terms; and whether this was a 'very small' termination for the flue or not, depends altogether on the size of the beginning of the flue. Now, as you did not see, and cannot tell us, what the size of the one end was, do you not think it is somewhat rash in you to give any opinion as to the size of the other?"

Mr. Brunel being asked to point out specifically the parts of the plaintiffs' apparatus which he considered new, replied that he did not think there was any one part which, taken by itself, could be called new, but that the combination—the general result—was new to him.

Mr. Partington was shown the Number of the "London Journal of Arts and Sciences" for November, 1830, which was stated on the cover to be edited by "W. Newton, civil engineer and mechanical draughtsman, and by C. F. Partington, of the London Institution," and contained an article in which the boiler then at work at Mr. Galloway's was described as differing very much in its construction from the specification of the plaintiffs (see Mech. Mag. 22d January, 1831), in order that he might reconcile the account given in the Journal edited by himself, with his present contradictory evidence! His answer was extraordinary:—"I know nothing of this article, nor of the engraving which it refers to; I did not furnish either of them; I never saw them before—never till the present moment!!!"

Sir James Scarlett, for the defendants, dwelt particularly on two points,—1st, the

want of evidence that the plaintiffs had ever made use of a boiler constructed in the manner set forth in their specification (the point on which Lord Tenterden, at the former trial, directed the plaintiffs to be nonsuited); and, 2d, the great difference in point of principle between the two boilers—the object in that of the plaintiffs being, confessedly, to *detain* the heated column of vapours within the flue; and in that of the defendants, to *accelerate* its passage as much as possible, consistently with the main purpose of the apparatus, namely, the extraction of the heat.

Mr. Cheffins, mechanical draughtsman, stated, that he had seen the apparatus at Mr. Galloway's factory, which was said to be constructed according to the plaintiffs' specification; but that there was no column of water at the termination of the flue, nor he supposed any obstruction whatever at that part, for he saw the smoke passing freely out at the top of the pipe which should have held the water.

Dr. Ure deposed, that he had carefully examined the specification of the plaintiffs, as given in the Mech. Mag., No. 389,* and also the specification of the defendants; that he thought the two inventions proceeded on perfectly opposite principles, and bore no resemblance whatever to each other; that in the boiler of the plaintiffs the column of air was forcibly detained in the flues, with the notion of extracting in that way the heat from it, and purifying it before its escape into the atmosphere; but that in the boiler of the defendants the great object was to force the air through as quickly as possible; that in the one case the current (if current there could be at all) must be an intermitting one, while in the other it was unintermitting; that the principle of celerity on which the defendants proceeded was the sound and philosophical one, for that it had been observed by Sir Humphrey Davy, and subsequently confirmed by other chemists, that a much greater quantity of heat can be obtained from a given quantity of fuel with a rapid combustion, than from the same quantity with a slow combustion; that the difference arises from the quantity of carbonic acid gas which is evolved in the process of combustion, and which is of a nature destructive of combustion; that while the plaintiffs detained this carbonic acid gas till it might possibly be in quantity enough to smother their fire altogether, the defendants very properly got rid of it as speedily as they could; and that he did not think the intermitting method of the plaintiffs could answer in practice, for if the pressure of the injected column of air were at any time equal to raising entirely the valve at the end of the flue with the column of water upon it, it would blow the water out of the pipe altogether; and if the valve were only partially raised, the water would find its way into the flue and lend its assistance to the carbonic acid gas in putting out the fire.

Mr. Hill, for the plaintiffs, asked Dr. Ure how it happened that, if celerity of exit was so much an object with the defendants, they employed so long and so narrow a flue? Dr. Ure explained, that by the length and narrowness of the flue—by its tapering and winding form—the heat was more readily and completely extracted from the column of air; that were a short flue of large area employed, the centre of the column of air, which is always the hottest portion, might pass off into the atmosphere without imparting any of its caloric to the pipes—but that by diminishing the size of the column and compelling a constant shifting and changing in the arrangement of its particles, by means of the continued narrowing of the flue and its different bends, there was little chance of any portion of the column escaping without coming in contact with the sides of the flue in the course of its passage through it; and that, in point of fact, the column of air, at its exit from the defendants' flue—as he had himself witnessed—comes out nearly cold.

Dr. Ure was further asked which method he thought best calculated for accelerating the draft—the bellows at the furnace mouth, or an exhauster at the end of the flue? replied that he decidedly preferred the latter, and had no doubt it would be found in practice the most efficient; for in consequence of the easily compressible nature of air, or, to use a popular term, its sluggishness, it had always been found an extremely difficult matter to propel air through any considerable length of pipes, and to employ an exhauster at the end of the flue was to employ the means of acceleration where they were sure to be most wanted.

Dr. Arnott also thought the two modes of generating heat quite different, and for similar reasons to those given by Dr. Ure; though, if the valve at the extremity of the plaintiffs' flue were taken away, he should say that in point of form the two boilers were very much alike.

Mr. Sadler, C. E., could see nothing new in any part of the plaintiff's invention, or utility in it as a whole. The throttle valve for supplying the fuel in particular (on the novelty and utility of which great stress had been laid in the application for a new trial), he had known

* The copy of it there given, as also the illustrative engraving, were supplied to us by Mr. Galloway himself.

to be used upwards of forty years ago, but abandoned on account of its liability to get clogged, when a hopper with double slides was substituted for it, very similar to that employed by the defendants. He could say, from long practical acquaintance with furnaces and boilers, that an apparatus constructed in the manner described in the plaintiffs' specification, could not be employed to any good effect.

Mr. Field, of the firm of Maudsley and Field, engineers, had carefully examined both specifications, and thought the mode of generating heat adopted by the defendants altogether different from that of the plaintiffs.

Mr. Cubitt, the builder, stated that as soon as he heard of the boiler invented by the defendants, he waited on Mr. Braithwaite, and was so satisfied with the explanation he received of the advantages of his new mode of construction—he thought them so clear and indisputable—that he immediately gave an order for one, which was accordingly supplied, and has ever since been at work on his premises, and fully answers the expectations he had formed of it. The boiler so furnished had not the least resemblance to that of the plaintiffs.

Mr. William Braithwaite deposed, that Messrs. Braithwaite and Co. had manufactured and sold a great many of their improved boilers, but that by far the greater number—at least ten to one—were with exhausters instead of blowers; that, indeed, they never made any now with blowers, which were found not to answer nearly so well. (So much for Dr. Birkbeck's ridicule and philosophy!)

Mr. Pollock, for the plaintiffs, having replied on this evidence,

The Lord Chief Justice proceeded to sum up the case. His Lordship observed that his predecessor, Lord Tenterden, had in the former instance nonsuited the plaintiffs, from an idea that air-tightness was an essential feature of their invention, that is to say, that as they had not shewn that they had ever used an apparatus with the valve at the extremity of the flue, kept closed by a column of water or other equivalent weight, in the manner set forth in their specification, they had therefore failed in sustaining their patent; but, for his own part, he did not consider such air-tightness an indispensable condition of the invention. The plaintiffs in their specification say, "C is the plate or valve by which the smoke, gas, and heated air are compressed according to the pressure placed on such plate or valve, *either by any weight* or fluid, or *by any other known means* of producing any re*quired resistance.*" All that seemed indispensable therefore was, that the "required resistance"—the necessary degree of compression—should be produced; and if that could be obtained by narrowing the outlet, as well as by a weighted valve, he thought such a mode of effecting the object must be held as covered by the words—"any other known means." Several of the witnesses for the defendants, indeed, had given it as their opinion, that an apparatus constructed in the manner set forth in the plaintiffs' specification would not work; but he did not think that any mere opinion of this sort was to be put in competition with the positive testimony of such men as Dr. Birkbeck, Mr. Turrel, Mr. Brunel, Mr. Bramah, and Mr. Partington, who all swore that they had actually seen the plaintiffs' apparatus at work—

Mr. Rotch (in the absence of Sir James Scarlett, who had left the court,)—"But, my Lord, you will permit me to observe, that not one of these witnesses swore that there was any column of water on"—

Lord Chief Justice.—"I beg I may not be interrupted."

Mr. Rotch sat down, and his Lordship, without adverting to the important point raised by the learned counsel, proceeded to read to the Jury his notes of the more striking parts of the evidence, the weight of which he appeared to think preponderated greatly in favour of the plaintiffs.

The Jury retired, and on their return, after an absence of about three quarters of an hour, the foreman said that they found for the plaintiffs, with damages One Shilling!

The result of this new trial, though very contrary to our anticipations, has not shaken in the least the opinion which we have all along expressed of the case. We must, with all due submission to the learned Judge who presided, contend (as Mr. Rotch seems to have intended to do), that the evidence for the plaintiffs fell as far short of proving a use of their boiler, in any manner set forth in their specification, as ever. Were we even to concede to his Lordship, that the terms of the specification are such as to cover every "known means" of producing compression of the heated air within the flue, we should like to know what evidence there was to show that, in the boiler seen at work by the plaintiffs' witnesses, any means of compression whatever were employed? Not one of them ventured to state, as of his own knowledge, whether "the plate or valve" C was there or not, or whether the flue was wide or narrow at its termination; and for the best of all reasons, that they knew nothing about it. All that their evidence amounted

to was, that they saw an engine at work, which they were *told* and *understood* was constructed in the manner specified by the plaintiffs. For any thing that they knew the flue might have had a vent as wide and free as a town-sewer; or it might, instead of terminating in the vertical pipe, which they took for the actual chimney, have terminated in some underground channel, and the smoke have been conveyed through this secret channel to some distant and unsuspected outlet. We do not ask the reader to believe either the one thing or the other; it is sufficient for the purpose of our argument, that the one is probable enough, and the other possible enough; and this much there is, certainly, nothing on the face of the evidence to gainsay. *Compression* there must be, at all events, even according to the Chief Justice's view of the matter, to justify the verdict for the plaintiffs; and yet certain it is *no compression was proved.* But is his Lordship's view of the matter a sound one? Must the use of any and every "known means" of compressing the air in a furnace-flue be of necessity an infringement of the plaintiffs' patent? We submit that this is such an interpretation of the plaintiffs' specification as is accordant neither with the letter nor the spirit of it, and is, besides, very much at variance with common sense. If the reader will refer back to the passage quoted by his Lordship, he will perceive that all that the plaintiffs claim as their own is "*the plate or valve* (C) by which the smoke, gas, and heated air are compressed," whether that plate is kept down by a column of water, by any solid weight of metal or wood, or by "any other known means of producing any required resistance." The "resistance" meant here is, plainly, resistance to the rising of the plate or valve, and not such resistance as might be produced by a narrowing of the flue. From the beginning of the specification to the end, there is not a single expression which indicates that the plaintiffs ever contemplated the narrowing of the flue as a means of compression. On the contrary, they state expressly that "the plate or valve," with a weight of one kind or other, is *the* means by which, in their apparatus, "the smoke, gas, and heated air are compressed;" and they lay claim to "every known means of producing any required resistance," only in as far as such means may be employed to keep down a plate or valve so placed for the purpose of compressing "smoke, gas, and heated air." To have claimed the "every known means" in the general sense in which the phrase has been taken by Chief Justice Denman, would have been absurd—since the fact of their being "*known*" was sufficient to place them out of the reach of any patent. Surely, therefore, Lord Tenterden was right in holding, that if the plate or valve be taken away there is an end of the peculiar means of compression for which the plaintiffs took out their patent. and an end, consequently, of the question of infringement. On the present trial there was no evidence to show whether the plate or valve was retained or not, but it is certain, from the evidence adduced on the last, that had the real state of the fact been brought to light —*as it ought to have been*— it would have been seen, that when Dr. Birkbeck, and the other witnesses examined, saw the engine at Mr. Galloway's manufactory at work, there was no plate or valve whatever made use of. The following extract from our report of the last trial will suffice to set at rest all doubts on this head:—

"*Mr. John Galloway examined by Sir James Scarlett.*

"Now, put your finger on the valve C, and inform us whether the machine you have constructed and now use has that valve?—Yes; we have it in the one we are now working.

"And has it any weight upon it?—*No;* it is only of small area—a small pipe.

"Which is open to the atmosphere?—*Certainly.*

"Then the valve is constantly kept open?—*The valve is open.*

"Lord Tenterden.—*The valve is not confined by water or pressure of any kind?—No.*

"Sir James Scarlett.—Then, in the machine you are now using, you pump in air at one end, and that other extremity, therefore, on which you put your finger, is the chimney, by which the smoke is conveyed away, *and that is now constantly open?—Yes,*

"Neither pressed by the column of water nor by any other weight?—No; but restrained by being small.

"Which (smallness) you never had recourse to till after the defendants' invention?—I have no recollection of it.

* * * * * *

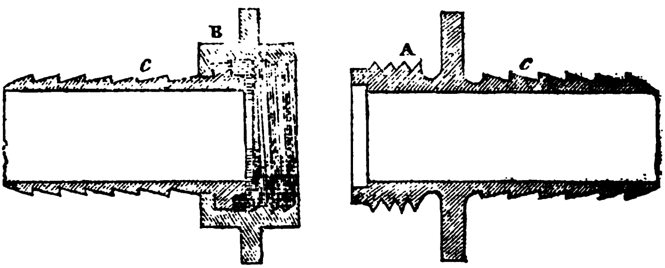
"Lord Tenterden.—It appears to me, on looking at the whole of the patent of the plaintiffs, that it is an essential part of their invention that the exit of the air, which is forced into the flue, should be in some way prevented. This they do by means of a valve, kept down by a weight or a column of water. Now, the defendants, instead of having any such valve, regulate the exit of the air by contracting gradually the tube, or flue, or whatever else you may call it, till in the end the air passes freely through and goes off the chimney. I think the two methods are essentially different."

We might insist much on the respect which is due to the opinion of a Judge of Lord Tenterden's acknowledged discernment and great experience in patent cases; much also on its being in conformity with that of another equally high authority in such matters, Lord Lyndhurst,* who,

* Lord Chief Justice Denman found much fault with Lord Lyndhurst for giving any opinion on the case, seeing that he left the plaintiffs at liberty to bring it before a jury, and there was every probability of their doing so. But might not his Lordship have been actuated by the very praiseworthy motive of saving the parties the expense of further proceedings? And will the matter of propriety in giving the opinion alter the fact that such an opinion was actually pronounced?

when an application for an injunction was made to him, pronounced the rival inventions to be entirely different (making thus two Judges to one in favour of the defendants;) something also on the superior credit which belongs to the testimony of such thoroughly scientific men as Ure and Arnott, or eminently practical ones as Sadler, Field, and Cubitt, when compared with the mediocrity, superficiality, smatter, and pretence personified on the other side; a little, too, on the inferior capability of common jurymen to comprehend a question of this scientific nature: but from all this we refrain, since it sufficeth for objection to the result of this last trial to show, as we humbly submit we have done, that both the charge of the Judge and the verdict of the Jury were at palpable variance with the evidence adduced. We understand that it is the intention of the defendants to apply, in their turn, for a new trial; and conscientiously believing them to be in the right, we wish them every success.

IMPROVED UNION-SCREW FOR FIRE-ENGINES.



Sir, — Among the various improvements introduced into the London Fire-engine Establishment, the connecting screws of the hose is not the least important. This joint, of which the above is a sectional view, was designed by John Robison, Esq., Secretary of the Royal Society of Edinburgh, for the fire-engine establishment of that city.

From the above it will be seen, that a regular and uniform water-way is preserved throughout.

A is the male, B the female screw, revolving freely on the shoulder of the joint. The male screw ends in a cylinder of the diameter of the bottom of its thread, consequently of the diameter of the top of the thread of the female screw. The effect of this is, that when the screws are brought together the cylindrical part serves as a guide to the threads, and the most inexperienced person cannot fail to make them catch on the first attempt. The great advantage of this arrangement, under the circumstances attending fires, must be obvious to all. It is not to the hose of fire-engines alone, however, that this improvement is applicable: in every case where screws are employed this valuable though simple improvement may be used with advantage, all that is necessary being to cut down the first thread or two of the male screw.

There is another good quality attending this joint, which is the excellent method of securing the leather hose to it, which is very much superior to the plan heretofore adopted. The tying places of this joint are indented in the manner delineated above, at *c c*. Although the furrows are rather shallow, the form of their edges offers a very great resistance to the slipping of the leather after once on, while they at the same time give every facility to getting the hose on without unnecessary stretching.

Although these joints require three or four turns to screw them up, yet as it is only the ring B that requires to be turned it can easily be done by the hand alone, without the use of keys; for while the joints are kept properly cleaned and in good order a man can always make them tight with his hand.

The excellent condition of the joints, as well as every other part of their machinery, reflect great credit on the London Fire-engine Establishment; an inspection of their several stations* will afford much gratification to all who feel an interest in those matters, and can fully appreciate the good order and neatness they display.

I am, Sir, yours, &c.,
WILLIAM BADDELEY.

* Vide last vol. p. 208.

NOTES WORTH NOTICE.

"Modern improvements in locomotion have virtually shortened every road, and the best way to make a mental progress of corresponding rapidity is to take the *shortest ways* in literature. A very long essay will tire as much as a very long walk."

Progress of Rapid Communication.—The London and Birmingham Railway is at length commenced, excavations being now going on in the fields between London and Hampstead, and the whole undertaking will doubtless be completed in less time than it has taken to obtain the Act of Parliament. For the first twenty miles of its course the railway is intended to follow the track of the Grand Junction Canal, but at Boxmoor it will diverge, and take the course of the river Gade, by Hemel-Hempstead and the Vale of Gaddesden, instead of that of the Bulbourne, by Berkhamsptead and Tring. We are not aware whether operations have yet commenced at the Birmingham end of the line.

The Nearest Railway to London.—The Greenwich Railway, the Act having passed to authorise its formation, has also been begun, and sanguine expectations are entertained that it will be ready for the conveyance of the Cockneys to the delights of the Fair by next Easter Monday. It has been proposed (while the thing is in hand) to *extend* the line as far as Dover—Dover being *seventy* miles from London, and Greenwich at least *four!*

March of Mind to the East.—In addition to the "Canton Register," a newspaper which has been some time established in the Celestial Empire, an "Anglo-Chinese Almanack" is now published at Macao, under the direction of Dr. Morrison, with the English and Chinese Calendars in opposite columns.

Conclusion of a Grand Undertaking.—Mr. Buckingham's "grand undertaking" has concluded in the way it might have been expected to do—to nobody's advantage but his own. After all his disinterested endeavours to induce the public of England and France to "aid the progress of civilisation," by presenting him with a ship fitted out for sea, free of expense, a sufficient sum could not be raised, although a few hundreds *were* paid into the banker's hands. How was this sum to be applied? Some said in furtherance of the subscription to send an expedition in search of Captain Ross; but the member for Sheffield knew a trick worth two of this: he very modestly proposed that it should be applied, without any more concern about voyaging round the world to "sow the seeds of civilisation," to the purchase of a life-annuity for Mr. and Mrs. Buckingham!!" *This has accordingly been done;* and this eternally ill-used individual closes accounts by publishing a Supplement to his "Parliamentary Review," detailing these facts, pointing out to his non-subscribers the evils that must arise from their niggardliness in refusing to set him going on a trading expedition for *his own* advantage at *their own* expense, and roundly abusing the British public and government for letting so hopeful a scheme drop to the ground, with no other result than the securing a pension of 35*l.* per annum to the most unfortunate man on the face of the earth!

French and English Liberality. — We hear occasionally a great deal about the astonishing liberality of the French in throwing open their Museums and Libraries at all times and seasons to the lowest as well as to the highest. Yet how stands the matter? The public are admitted to the Louvre on Saturdays and Sundays from *two* till *four*—two hours twice a week! Our Museum is at any rate much more accessible than this; and that no narrow system of exclusion is adopted there is evident from the fact that charity-boys are its frequent visitors. The Parisian Bibliothèque Royale is only open twice a week, for four hours each time. Unfortunately, in this particular, we have no opportunity for comparison!

Last News of Liberia.—Notwithstanding the humbug has been so often exposed, the free colony of Liberia is still on its legs, although in rather a tottering condition. The disinterested agent of the American Colonisation Society is again in London, endeavouring to raise supplies for the benefit of the democratic slave-holders of the United States. Luckily the public is now too well awakened to the real merits of the scheme; and consequently, in spite of the influence of the name of the Duke of Sussex, who had been prevailed on to take the chair at a recent meeting in aid of the funds of the Society, it proved a miserable failure, only two or three determined philanthropists (Yankees?) attending. It is to be hoped the hint is broad enough to be taken.

Science in the Peninsula.—We are accustomed to consider the Spaniards as sunk in the lowest depths of scientific ignorance, but it appears that they are not unwilling to accept at least of as much enlightenment as the treatises of the Useful Knowledge Society may afford. Most of these are translated, and published at Barcelona, from whence they are distributed throughout Spain by almost as many country agents as the English Society itself numbers in its train. This is not the only instance of their attention

to modern English literature, translations of the "Waverley Novels," and (oh! *tempora*,) "Cobbett's History of the Reformation," having been highly popular. The Queen of Spain also made a conspicuous figure in the list of subscribers to the testimonial to Sir Walter Scott.

Gresham Commemoration.—This is the title of as ridiculous a piece of tomfoolery as the world has been entertained with for some time;—a musical performance at Haberdashers' Hall, in honour of Sir Thomas Gresham's foundation of his college, or the complete smothering of his institution—it can hardly be discovered which. The prospectus for this piece of stupidity is most disgusting: it tells us, that "*in after ages*, when the literary and scientific institutions of this metropolis shall have *entered into rivalry* with those of *foreign cities*," the name of Gresham will be freshly remembered. Was ever any thing equal to this for ignorance and insolence, except, perhaps, the idea of the whole concern? Those citizens who have disgraced themselves by suffering their names to appear in connexion with this miserable affair, would have done themselves far higher honour by exerting their influence to procure the application of the funds left by Sir Thomas Gresham to their original purposes, and especially by doing what they could to render at least the Gresham Lectures efficient. As to Lord Burghersh and his aristocratic coadjutors, it is a pity they were ever prevailed on to honour the city of London with their presence. Why cannot they stay in some of those foreign cities whose institutions are so much more congenial, instead of outraging all propriety by getting up a tweedle-dee commemoration of the noble merchant, whose magnificent bequests have so long been completely perverted from their original intent!

F. H.

DEATH OF B. BEVAN, ESQ., C. E.—We lament to have to announce to our readers the death of our able and much esteemed friend and correspondent, Mr. Bevan, the Engineer of the Grand Junction Canal Company, author of the "Treatise on the Slide-Rule" (the best ever published), the "Guide to the Carpenter's Rule," and of numerous valuable contributions to this and other scientific works. He died at his house at Leighton Buzzard on Monday, the 1st of July. We extract the following interesting notice of his last moments from a letter from Mr. William Andrews, of Ivanhoe, Bucks:—"On Monday last, in the evening, Mr. Bevan attended a public meeting of the inhabitants of the town; at night he was taking observations of the eclipse of the moon: during the eclipse he called Mrs. Bevan to witness the beautiful sight; but almost immediately after he was taken suddenly ill, and in a few minutes was a corpse." He was in the 61st year of his age.

Mr. Hall's Steam-Engine Improvements.—We insert, at Mr. Hall's renewed request, so much of his letter, alluded to in the "Interim Notices" of our last Number, as refers to that part of Mr. Robson's communication in which he asserts that Mr. Hall's steam-engine is still "untried."—"Now, the truth is, that not only has Mr. Hall long had two engines of his own in operation, but there has been one at work nearly three months at the factory of Messrs. Samuel Cartledge and Son, of Bulwell, near Nottingham, of the following dimensions:—cylinder, 22¼ inches diameter, 3 feet 6 inch stroke, strokes per minute 36." We may add, that the latter fact is confirmed by a paragraph in the *Nottingham Journal* of the 15th of June last, which states, that "the workmen in the factory of Messrs. Cartledge and Son, at Bulwell, together with those in the employ of Mr. Hall, of Basford, partook of a supper at Mr. Hall's works, which was jointly given by Messrs. Cartledge and Son and himself, to celebrate the highly successful and satisfactory application of Mr. Hall's patent steam-engine to Messrs. Cartledge and Son's works, at Bulwell;" and that on a subsequent evening, "the females employed by Messrs. Cartledge and Son were treated with tea, at Mr. Walker's, publican, in Bulwell, to celebrate the same event, and spent the evening in the most cheerful and agreeable manner." What can Mr. Robson possibly have to say to this? What is criticism—what science even—against Nottingham ale? Or the opinions of a whole host of philosophers against the approving smiles of a coterie of spinning *jennies?*

Trade Companionships.—In Russia there are companies of free labourers termed artels. The artel elects a chief, and takes his name. The numbers run from 20 to 60. When a candidate offers himself for admission his character is inquired into, and he is only admitted on its proving good, and on his furnishing caution to some specified amount; the artel then becomes responsible for losses occasioned and thefts committed by him. Their character is deservedly high. * * This resembles the voluntary associations of the Anglo-Saxons termed gild-scipes, in which the members were bound to protect each other, and were rendered by law responsible for each other. — *Urquhart's Turkey and its Resources.*

INTERIM NOTICES.

Mr. Badnall, in answer to Mr. Cheverton; Mr. Sanderson, on the failure of the Sheffield and Manchester Railway; and Mr. Shalders, on his pump-all in our next.

Communications received from Mr. Ballingall—Mr. Foord—T. D.—Enort—Δ.—Mr. Lawson—Mr. Glynn—Mashdoud Mohandez.

Errata.

Page 194, col. 2, line 6 from the bottom—for "when the sun is on the same side of the earth" read "when the earth is on same side of the sun."

Page 195, col. 2, line 21—for "refractory" read "refractive."

Page 195, col. 2, line 48—for "is not capable of assuming light" read "is not capable of assuming colour."

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SYLVESTER'S IMPROVED FIRE-PLACE

Fig. 1.

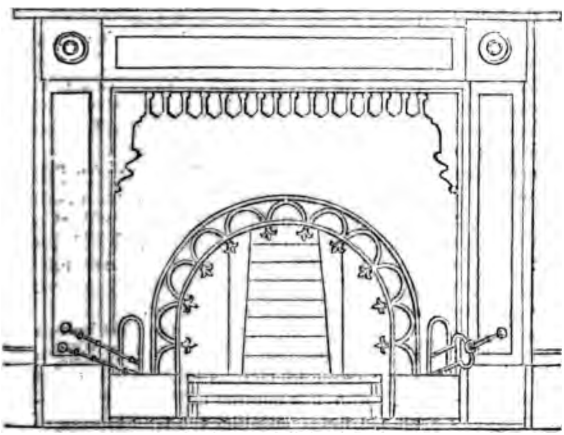


Fig. 3.

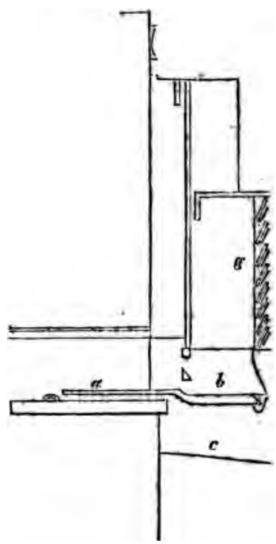
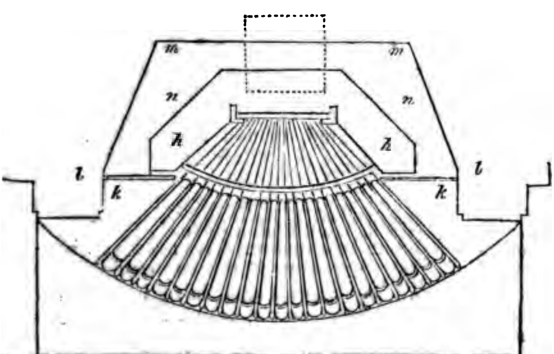


Fig. 2.



SYLVESTER'S IMPROVED FIRE-PLACE.

[From Mr. Loudon's Encyclopædia of Cottage, Farm, and Villa Architecture.]

Sylvester's fire-place exhibits the last great improvement in this mode of generating heat. It presents a return to the primitive simplicity of making fires on the earth; but it has joined to that simplicity a beautiful application of science. One of the greatest novelties in the appearance of this fire-place (fig. 1) is that it has no fender. Fig 2 is the plan of the fuel chamber, and a vertical profile of the hearth, in which the latter is shewn, composed of radiating spokes of cast iron, the narrow extremities of which serve as the bottom bars of the grate. Fig. 3 is a section through the centre of the fire-place, in which *a* is the broad part of one of the spokes mentioned; *b* the narrow part forming the bottom grate of the fire; *c* the ash pit, which is large enough to contain the ashes made during a week; *d* is a piece of fire-stone or fire-brick, forming the back of the fuel chamber; *e* is an orifice by which air enters under each spoke to the ash pit; and, rising up among the bars *b*, supports combustion; *f* is the hearthstone; and *g* cast-iron plates, placed like luffer-boards, which form the back of the fire-place. These plates are all movable, and their use is to regulate the draft by dividing the current up the chimney. In ordinary cases the whole of the plates may remain, as in the figure; but where it is desired to increase the draught of the fire, by taking out only two of these luffer plates at the bottom, next the fire-stone *d*, a draft will be created like that of a close furnace; and hence it is that this fire-place will *cure any smoky chimney whatever.* In the ground plan (fig. 2) it will appear that the two sides of the fire-place, *h h*, are not in contact with the joints *l*, or the back *m*, in consequence of which much heat will be radiated into the space *n*, and will pass into the room through the openings of the sides *k k*. The use of the screen, shewn in fig. 1, is to conceal the openings between the fuel chamber and the joints, yet, at the same time, to admit of the free circulation of air. These stoves are of such very recent invention (1833) that little can be said respecting them from experience; but from theory, and *a short trial, they* appear to us superior *to all other open* fireplaces.

THE UNDULATING RAILWAY.

Sir,—Mr. Cheverton having openly avowed himself as a disprover of the principle which I have advocated in my "Treatise on Railways," and having publicly announced what he conceives to be the *primary error* into which I have fallen, I consider it a duty which I owe to his candour—as the only individual who in your pages has given to his reasoning the sanction of *his name*—to point out, with as little delay as possible, the untenable grounds upon which his arguments are founded.

I thank him for the lenient spirit which he evinces towards me; if he knew me better he would not fear the chance of giving offence by bringing into the field his *strongest* instead of "*gentlest*" force of artillery.

Mr. Cheverton says, I appear to think that "the locomotive force which urges a carriage along a level plane is not of a similar kind to that of gravity, which carries it down an inclined plane;" and upon *this consideration* he establishes his conclusion that I am in error.

I confess to Mr. Cheverton that he has rightly construed my opinion; and I am also bound to confess that he is the first man who has pointed out in your Magazine, what I consider the true ground of argument on this subject. *If he be right my theory is wrong.* I wish I could induce him, and your readers in general, to believe that the question is confined to so narrow a limit, that if *he be wrong my theory is right.*

Mr. Cheverton says, I speak of gravity as being a uniformly accelerating force, but that I do not admit of the motive force of the engine being of an accelerating kind, though I must be aware that it is a constant force.

Now, the locomotive steam power, by which a carriage is dragged or propelled along a horizontal line, is well known *not* to be a constant force: we will, however, argue as if it were, especially as all my experiments have been made with *spring* power, which may justly be called a constant force.

Practically speaking, it is indisputable that a locomotive steam-engine, if started from a state of rest upon a horizontal plane, soon attains a maximum velocity; and it is also indisputable, that it requires *all* the power which that engine is capable of exercising to maintain that

velocity. This, however, is not the case, *theoretically* speaking, as any constant force must be considered to produce an uniformly accelerated velocity.

Now, whether Mr. Cheverton speaks practically or theoretically, he is equally in error.

The force of gravity not only produces an uniformly accelerating velocity, but the force itself is, in theory and in fact, an uniformly *increasing* force. Supposing, therefore, *friction to be overcome*, and a constant force to be exercised on any body traversing a horizontal line, the result would be that the velocity would be uniformly increased; but as there is no mechanical force whose intensity, like the force of gravity, can increase with every increase of velocity, the difference in the velocity of two bodies, one descending an inclined plane and the other traversing a horizontal line, would be in proportion to the amount of increased power brought into action by the nearer approach of the descending body to the earth's centre.

So much for the theory—let us now consider the subject practically.

Locomotive steam-power, according to the present construction of the engines, is *not constant*. Supposing, however, that by improved construction it were so, it is a fact established beyond all doubt, though never YET publicly accounted for, that the friction upon the road decreases as the velocity increases; hence, though a constant power were at disposal, its effective employment would be diminished for want of fulcrum, when the velocity was very great.

Now, down an inclined plane the force of gravity is ever active, and the velocity is uniformly accelerated, evidently proving that Mr. Cheverton is wrong, when he states that "the time (occupied in traversing a given distance) will be precisely the same whether the carriage travel down an inclined plane, or along the horizontal line." He certainly endeavours to correct this error by completely proving the truth of my reasoning: he says, "If the surplus force be not uniformly accelerating as that of gravity, or not of equal intensity, then the space which will be required before the carriage would attain uniform motion would be greater on the horizontal line—that is all." My answer to Mr. Cheverton is—*that is every thing*, for uniform motion, practically speaking, never can be attained down an inclined plane, whereas it ever must be attained on a horizontal line, whatever mechanical force may be applied.

But Mr. Cheverton says, "the working force, or that opposed to resistance, is of course supposed to be the same in each case." I will not suppose any such thing; but even if I did, will he tell me that the *resistance* which that force is required to overcome is the same in each case? Is the friction down a plane, inclining at an angle of 22½ degrees, the *same* as on a level plane? Surely some of your readers will, *at least*, be candid enough to acknowledge that I am correct in my views as to the *laws* of *falling bodies*—and, if correct, agree with me that Mr. Cheverton's reasoning is altogether erroneous. He says, *I should compare only the ultimate velocities*—alluding to the Adelaide-street experiments. I have not the slightest objection but if he find that those velocities *are alike*, and that the one velocity was attained *sooner* than the other velocity, surely he will admit that it was owing to the undulations *that it was so*. Let me ask him also for another admission: supposing these velocities, *being alike*, were maximum velocities—I mean, that the carriage could not travel more rapidly on the horizontal line; and that, on the apex of every curve, that velocity could not be increased; and let the numeral 1 represent this velocity—will he for one moment dispute that, throughout the descending and ascending spaces of every undulation, *that* velocity *must be increased* down each descent, according to the laws of falling bodies, in the proportions of 1, 3, 5, 7, 11, &c., and up the ascent in an inverse ratio, until, upon each apex of the curve, the velocities would be again alike?

The length of the models in London is not sufficiently great, and the curves are far too minute, to admit of any very striking evidence of advantage, if the engine start upon each railway at a *very rapid speed*, down an inclined plane; but could the time be precisely ascertained it would be found that the difference would be in proportion to the extent and depth of the undulations, the amount of that difference being easily determined by indisputable calculation; if the velocity at the foot of the inclined

plane were ascertained. A single curve, say 60 feet in length from apex to apex, and dropping 4 or 5 feet, would show a most decided advantage, if the engine were to start upon that curve, and upon a horizontal line of proportionate length, at *any velocity* Mr. Cheverton might suggest. This in my treatise I have mathematically proved—Mr. Cheverton, if he deny it, ought to give mathematical reasons to the contrary.

In allusion to my supposed case of a carriage moving along E A, at a velocity of 10 yards per second, Mr. Cheverton says, "Now this is exactly the case of a carriage which is *started* with the impulsive force of 10 yards per second, but which carries with it no more power than just equivalent to cope with the locomotive obstacles, and the velocity of which will be always the same as at the first instant of its projection. But if there be a surplus of locomotive force (and this is the particular Mr. Badnall forgets) over and above what is demanded for locomotive resistance, thenan accelerated and not a maximum velocity of 10 yards per second will take place."

Now what right has Mr. Cheverton to say *that I forget* the point which he considers so very important? *I do not forget it.* Do I not argue upon 10 *yards* per second being the supposed *utmost* velocity attainable on the horizontal line? Suppose I had taken a sufficient length of line, in calculation, and instead of 10 yards said 100 yards, as a maximum velocity per second, would not the result have been the same, unless Mr. Cheverton believes that *there is no maximum velocity* on a horizontal line, which in practice I firmly deny? Even supposing a power of steam *equal* to the power of gravity to be *constantly* kept up, the tendency of the carriage to rise from the rails at high velocities would so reduce the friction as to render that power proportionately less effective, and therefore soon render the motion uniform; whereas in the descent of an inclined plane the effect of the power of gravity would *never* be diminished at *any velocity*, nor would the motion *ever* (practically speaking) become uniform; though regarding this question with a philosophic eye we can imagine, it is true, an *extreme point* at which the * *peripheral force* (centrifugal force does not fully embrace my comprehension of this subject), being equal to the force of gravity, the *average velocity* might *possibly* become uniform.

* *See my* Treatise.

But I cannot allow Mr. Cheverton, even if he were correct, to suppose a case, which he does, where a comparison is drawn between a mechanical power *equal to gravity* moving a carriage along a level plane, and *the power of gravity alone* moving a like carriage down an inclined plane; thus, as he says, concluding "that the two forces, though dissimilar in their origin, being similar in kind, and having the same laws of action, the effects will be the same."

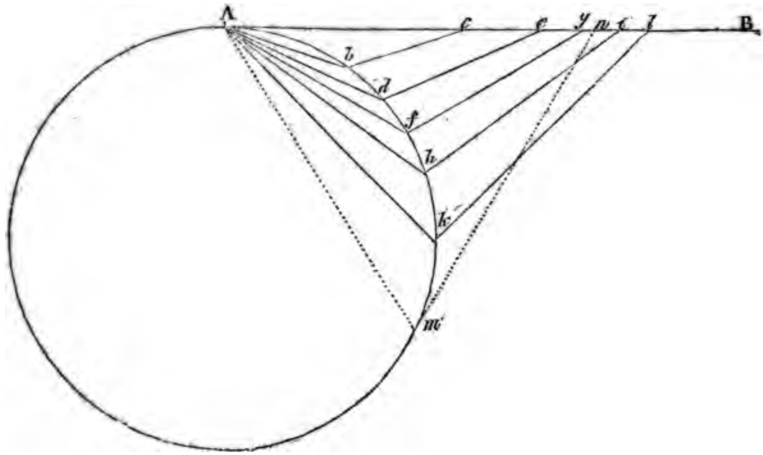
If he take P (the power) equal to G (gravity) on the level, I must beg him to consider P+G as the moving force down the inclined plane; and whatever extra value he may place upon P, I must have that value attached to it in both instances. I must also beg him, if he be inclined, to reduce the question to formula, and if he consider *f* to represent the friction on a curve and horizontal plane, *to take care to ascertain accurately the real value of* f *in each case.* This latter point *is most important.*

Mr. Cheverton has met me candidly and fairly. I am obliged to him for it, and I hope, until the subject is practically determined, he will be as open to conviction, if he does not see his way clearly in mathematical argument, as I shall feel it my duty to be.

I stated, in a former communication, that I would give my reasons for limiting, in my challenge, the ascending and descending angles of the curve to † 45 degrees.

Now it is an indisputable truth, that a body would *not move* along the horizontal line A B, from a state of rest at the point A, *without an impulse* (supposing friction to be entirely out of the question), yet it is equally true that the same body would fall from the point A to each point of the circumference of the described circle denoted by the letters *b*, *d*, *f*, *h*, *k*, *m*, in precisely equal times; and it is also indisputable that

† I feel it to be my duty to state that the following diagram is (without the explanation) the production of a very clever engineer, whose modesty I wish were less.



the same body, according to the principle of the pendulum, would rise from such respective points to the points *c*, *e*, *g*, *i*, *l*, in precisely the same times. This being the case, a body would require the same time to traverse a curve proportionate to the two inclined planes A *b*, *b c*, as a curve proportionate to the two inclined planes A *k*, *k l*. Thus if it were required to move a body (friction not being considered) the farthest possible distance along the horizontal line A B *by gravity alone*, it is obvious that the angles of 45 degrees, represented by the angles *l* A *k* and A *l k*, are the best angles of inclination for the ascending or descending lines of the curve, inasmuch as the body is found to traverse the distance A *l* in precisely the same time as it could traverse the distance A *c*; and so in reference to the respective distances A *c*, A *e*, A *g*, A *i*, A *l*.

Let us now see what distance the same body would traverse along the horizontal line, if it traversed a curve proportionate to the two inclined planes A *m*, *m n*. We find it could not possibly exceed the distance A *n*, which distance would be diminished upon every curve, the angles of whose descending and ascending lines approached nearer to a right angle than the angle *n* A *m*.

We will now imagine a given constant force employed, equal to the force of gravity to move a body from a state of rest at A along the horizontal line A B; and we will *also suppose* the same force to be employed in moving the same body along a curve proportionate to the lines A *b*, *b c*, and A *k*, *k l*: will not the average velocity, in comparison with the average velocity produced by gravity alone, be doubled upon each of the curves? And will not the velocity, on the arrival of the body at the summits *c l*, be *at least* equal to the velocity of the body when moving on the horizontal plane at the same points of distance from A? If so, we have only to ascertain the difference in time requisite to reach such points; and this difference is proved by the diagram, where gravity alone was taken into consideration. To be more clearly understood, I do not argue (and I never did argue this point) that the velocity of the body, at any given point of the horizontal plane, say the point *l*, was greater on the undulating line than on the level line; but I *do* argue (and I defy any man to disprove), that the point *l* is reached in *very much less time* upon the curve than upon the horizontal line; consequently, that the advance of the body is much more rapid throughout any given distance upon a curved than upon a horizontal railway.

I have not leisure now to enter upon the subject of friction, as accounting for the extra loads conveyed with a given power; and, consequently, not having been attacked upon this point, I leave the question I before put to "Junius Redivivus" open to a reply from any of your correspondents, merely observing,

that, instead of the calculations being *abstruse*, they are *perfectly simple*, and may be confined *to very few words and figures.*

In reference to Mr. Cheverton's letter, I have but two other observations to offer: one is (to avoid misconception), that when speaking of a carriage *starting* with an *impulsive* force of 10 yards per second, I conclude he means *with a constant and equal impulsive force;* otherwise I need not tell him that the velocity must gradually decrease. The second is, that he is at perfect liberty, as far as I have any control, to try any experiment he may think proper, believing, as I do, from the tenor of his letter, that he has a mind above prejudice, and is too sincere a lover of science to be unjustly partial.

In conclusion, I should have been extremely happy to have given some explanations, which I consider valuable, on the cause and effect of what I have termed *periphugal force*, a force to which *I have no doubt* we are indebted for the *unexpected* velocity attained upon the Liverpool and Manchester Railway; but I am in hope that *Mr. Robert Stephenson, sen.*, (an individual whose talents, like his brother's, will ever do credit to his name,) will be the first man to make public one of the most beautiful and important theories ever promulgated. I might *strongly* support *my own cause* by doing this; but the theory is his, and I am most anxious that he should divulge it.

I must beg to add, that I have not yet received your Number of the 22d instant. If, therefore, there be any attacks upon me my opponents must be patient. I feel it, however, incumbent upon myself to state that, anxious as I feel to discuss this subject publicly, I must for the future *decline replying to anonymous correspondents.** My time is so occupied that it is quite impossible for me to fire a gun at every unseen person who attacks my citadel. There *can be* but *one* or *two* weak points: let the attack then be *concentrated, open*, and *bold.* If I be defeated, I shall be defeated in a good cause—if victorious, nothing can be half so valuable to me as the approbation of scientific men.

One word to *Mr. R. Stephenson, jun.*—*If he have declared* that an undulating railway is not superior to a horizontal railway, I call upon him, *publicly*, not to spend *one farthing* of the *public money until he prove that his opinion be correct.*

On this subject I shall be perfectly unceremonious. I feel the greatest possible respect for him and for his undoubted talents; but I also feel a duty towards myself, to my profession as an engineer, and to the public, from which I shall not shrink.

I am, Sir,
Your obedient servant,
RICHARD BADNALL.

Farm Hill, near Douglas,
June 25, 1833.

* We beg to direct Mr. Badnall's attention to what we said last week on this subject of anonymous correspondence, being persuaded that he will, on reconsideration, see the fallacy of his objections to it. What is it he insists so strongly for? A mathematical demonstration! But will a mathematical demonstration be either better or worse that it has the initials of the author subscribed to it, instead of his name at full length? Mr. Badnall says, "My time is so occupied that it is quite impossible for me to fire a gun at every unseen person who attacks my citadel." The occupation, however, is an apology which would hold equally good whether the assailants were known or anonymous. Neither are anonymous assailants "unseen:" they are but masked, that is all. And what if a band of such should storm him or his citadel?—ED. M. M.

ON PRESERVING POWDER MAGAZINES FROM THE EFFECTS OF LIGHTNING.

Sir,—If an electrician, wishing to collect the electricity of the atmosphere, or to bring the lightning into his house for the purposes of experimental research, erects a lightning rod, a question naturally suggests itself—Can the present method of preserving powder magazines from the effects of lightning be correct? As the object is not to bring the lightning to the seat of danger, I should think not.

If we insulate a metallic sphere with a pole bored to its centre, and charge it with electricity, then take a small spherule, stuck on a rod of lac, and apply it to any part of the surface, and bring it in contact with the cap of an electrometer, the leaves will immediately diverge. Now bring the spherule steadily into contact with the centre of the sphere, without touching any part of the surface, and on instantly applying it to the cap of the electrometer, we shall not perceive the least divergence in them. If we now apply two hemispherical cups (that exactly fit the sphere), and remove

them by means of insulating handles, we shall find all the electricity in the cups, and the sphere will not affect the most delicate electrometer, proving that the electricity resides in the surface. This experiment suggests the substitution of sheet copper or zinc instead of tiles for the roof, and a metallic covering for the walls and bottom; but as this might be too expensive, probably strips of lead laid under the foundation, and carried across the bottom and up the middle of the walls, together with the pipes at the corners for conveying the water from the roof, would be found sufficient. Of course they must all be connected together by metallic fastenings.

Experiment.—Again, if we place a small parcel of gunpowder on the table of the universal discharger, and send the charge of a Leyden jar through it, the grains will be merely thrown about; but if the charge passes through a few inches of moist earth or mould, or a wetted string, it will most assuredly be fired. This proves that a stream of electric matter running along the ground, either to or from the conducting rod, is more likely to fire the powder than the shock itself, as there is what is called by electricians the lateral explosion, or returning stroke. There is an account, in Stanhope's work on electricity, of a man who was killed in this way, although the discharge happened at a considerable distance from him; so that it is possible for a magazine to be fired although provided with a conducting rod, and yet not be absolutely struck by the lightning. There have been lately two instances of magazines being fired though furnished with lightning rods.

I remain, Sir,
Your obedient servant,
G. DAKIN.

Dereham, June 29, 1833.

MORE POTTERY SECRETS

(Continued from p. 244.)

CHINA BODIES.

Nos.	1	2	3	4	5	6	7	8	9	10	11	12	13 J.M.	14	15	16	17	18
Bone	47	35	30	28	10	22	10	33	37	36	37	34	54	52	50	42	48	30
Stone	17	31	26	34	42	22	15	33	27	5	25	23	20	18	18	20	24	44
Flint	—	6	—	10	—	—	3	6	—	25	2	6	—	4	—	3	—	3
China Clay	30	14	38	10	38	26	27	12	27	31	31	32	22	22	28	32	25	3
Blue do.	6	14	8	18	10	30	45	16	9	3	5	5	4	4	4	3	3	20

Nos.	19	20	21	22	23	24	25	26	27	28
Bone	50	50	36	38	30	37	9	40	46	43
Stone	21	18	45	25	24	21	36	15	23	20
Flint	—	—	9	3	11	10	9	10	—	6
China Clay	29	32	10	34	35	32	46	35	31	31

No. 1 is a good, useful body. 7 should have the Glaze 5. 11 and 12 are New Hall Tea Ware and Jug bodies. 13 is very excellent. 14 not quite so good, the Flint affects it. 19 is good when fired up. 20 requires less fire. 23, 24, and 26, are good bodies. 28 is a very good body, with Glaze 4. 27, W. Mason's; requires care in firing.

CHINA GLAZES.

Fritts.

Nos.	1	2	3	4	5	6	7
Flint	06	—	2	6	7	—	—
Red Lead	33	5	6	2	3	6	20
Glass	—	24	30	2	90	82	70
Blue Calx	1	—	1	¼	—	—	—
Arsenic	—	1	4	—	½	6	5
Nitre	—	1	—	1	½	6	5
Borax	—	—	—	¼	—	—	—

Glaze.

Fritt. No.			
1	4	White Lead	1
2	5	Do.	2
3	4	Do.	1
4	6	Do.	1
5	3	Do.	1
6	4	Do.	1
2	5	Do.	2

Stain.—1 oz. Blue Calx to 20 lbs. of Fritt, and 4 of Glaze Lead.

(To be continued.)

IRON CONSERVATORY,

Constructed by Messrs. W. and D. Bailey, for Mrs. Beaumont, of Bretton Hall.

The conservatory represented in the above engraving was erected in 1827. It was 100 feet in diameter, and 60 feet high. It was constructed entirely of cast and wrought iron; all the perpendicular supports being of the former, and all the sash-bars, composing the ribs of the roof, of the latter material. It was ventilated by horizontal shutters, in a low upright wall, or rather iron screen; by upright windows, which opened inwardly at the base of the upper dome; and by a skylight, which was raised by weights under the terminating gilt coronet. It was heated by steam from a boiler placed in a house at some distance from it, the tubes being conducted under the floors of the paths. The cost for the iron work alone was between 3,000*l.* and 4,000*l.* It is worthy of remark, that there were no rafters or principal ribs, for strengthening the roof, besides the common wrought-iron sash-bar, which is two inches deep, and half an inch thick in the thickest part, and weighs only about one pound to the lineal foot. The upper dome had an independent support from cast-iron pillars. When the iron work was put up, before it was glazed, the slightest wind put the whole of it in motion, from the base to the summit; and so much alarm did this create in the party for whom it was put up, or their agents, that the contractors for the work, Messrs. W. and D. Bailey, of Holborn, London, were obliged to covenant to keep it in repair for a certain number of years. As soon as the glass was put in, however, it was found to become perfectly firm and strong, nor did the slightest accident from any cause happen to it, from the time it was completed in 1827 till, on the death of Mrs. Beaumont in 1832, it was sold by auction, and taken down. It brought only about 500*l.*, though it is believed to have cost in all upwards of 14,000*l.*—*Loudon's Encyclopædia of Cottage, Farm, and Villa Architecture.*

SHALDERS' PUMP.

Sir,—As Mr. Baddeley, at page 86, has discovered that the passive and the active cones in my Expressing Fountain *are new and essential*, I defy him to prove that my flexible cone is not original and indispensable; and even that cone Martin's pump has not. The three cones constitute the excellence of the

machine; change the form of one and its value is destroyed. If different figures had not inevitably different properties, why not play at billiards with ivory cubes and rive blocks with iron cylinders? Because orbs and wedges are the better figures. Mr. Baddeley has selected the length of the stroke in Martin's pump to convict himself, and shown a cylindrical figure, to prove the machine has a conical leather. But as the brass ring is full 11 inches wide that reciprocates inside the leather in Martin's 12 inch cylinder, to imagine that that leather is not a cylinder, but one of my flexible cones, terminating in less than three diameters, is altogether preposterous. The shortness of the stroke in Martin's pump proves, beyond all doubt, that he never knew how to block a conical connecter. However, it must be admitted that nearly 40 years extensive practice, in manufacturing leather for various purposes, enabled me to mature that which was insurmountable to Mr. Martin and others, namely, the manufacturing conical connecters; for although the first connecter that was ever blocked was incomplete after a week's hard labour, they are now as readily prepared as the fronts and backs of Wellington boots; and blocking of leather for boots is only of recent date. The length of the stroke of Martin's pump is 7 inches, and the length of the stroke of my fountain is 12 inches, when both machines are of the same diameter. As appears upon Martin's plate, the full tension of the leather cylinder is 4½ inches, allowing 9 inches range for his brass ring; not more, however, than 8 inches are at all safely available; *but the bagging and collapsing of the unsupported leather cylinder* are the fatal defects of Martin's pump, which further reduces the effective stroke more than another inch; for while the brass ring rises without discharging water, the lever falls without resistance, the operator is distressed by an intolerable jolting motion, and the leather is destroyed by its ugly flapping action, which causes considerable resistance.

Martin's pump, when practised and used by himself, failed, and every part of it is too far from nature for others to obtain a better result. But, on the other hand, the blocked leather cone in the fountain is 7½ inches long, giving 15 inches range to the expresser, and allowing 3 inches to retain *the rolling motion, and avoid unequal tension;* there then remains a clear effective stroke of 12 inches, with the most elegant action imaginable. Trying a pump without water in it, as Martin did, is not a satisfactory test of its being frictionless.

Captain Savary understood hydraulic machines well, and remarked, "If you try how small a matter will move the pistons of pumps, when not loaded with water, you will find the friction so small as to be not at all worth mending, could it be done; but when loaded with water the friction is vastly increased by the leathers of their suckers being forced broader, and rubbing with much greater force against the barrels they work in, according to the height the pipes are raised." Mr. Baddeley may deny, but he cannot alter facts.

Both law and equity justify my publishing and patenting an invention entirely my own, that has every essential part thereof novel and strange; but neither law nor equity can ever justify Mr. Baddeley in recommending an infringement upon my property, because he has been so unfortunate, even by his own shewing, as to publish a plate and description of a machine that he does not at all understand. I published the discovery, long before I applied for a patent, in the *Norwich Mercury*. I also published and shewed the effect, but kept the cause a secret, and my specification was enrolled before I heard or knew any thing about Martin or his pump.

If Mr. Baddeley had a patent for Martin's pump now in full force, and I had no patent at all, I should patent the Gravitating Expressing Fountain, and such patent would be easily sustained, upon the score of originality, against my opponents, who have so sadly committed themselves by ignorantly opposing *an invention that will aid and illuminate all future generations.*

Any pump, if well made, will hold water, the working parts of which never ought to be allowed to dry, whether used for a fire-engine or any other purpose. And, at any rate, fountain pumps, *when properly constructed*, are kept in order with the least expense and trouble; not a single connecter has yet failed in any fountain named in my letter of Feb. 9, 1833.

There is one very striking practical advantage that the rolling has over the rubbing principle, and it is this: when worked in lead or wood the cylinder wears out the packing of the piston, and the packing of the piston wears out the cylinder of the pump, which takes place in about four years, if worked for hours daily. But the flexible cone wears out neither the passive nor the active cone in the fountain. This fact has long established their reputation for being, in the long run, the most economical hydraulic machines in the world.

Here I anticipate that the controversy respecting the identity of Martin's abortive cylindrical pump and Shalders' matchless conical fountain ceases for ever. The public is so charmed with the invention that I have supplied twenty purchasers with upwards of seventy fountain pumps; and it is not to be supposed that they are silly enough to pay 30*l.* or 40*l.* a year each merely for the sport of rubbing a piston against a cylinder. The men, too, are as well pleased with their work being made easier as the masters are with saving their money, notifying that my pumps are peacemakers amongst the operatives, who were always wrangling, when they had the best London pumps, about who should perform that laborious duty. Now that they have fountain pumps, every man cheerfully takes his share of the work, it being so easy and so soon accomplished; and whether water be clear or foul, fresh or salt, or be raised one foot or one hundred feet high, with a fountain pump both masters and men declare it is PUMPING MADE EASY.

I am, Sir, yours obliged,
W. SHALDERS.

Bank Place, Norwich,
June 28, 1833.

P. S.—If Mr. G. Hallen Cottam will construct a 6 inch and a 4 inch cylindric pump, and work the first with a lever that has a 4 inch and the last an 8½ inch resisting arm, the two pumps will deliver equal quantities of water per stroke, and require equal power to work, if the acting arms of the two levers are of a length, notwithstanding the larger column of water weighs 7,865 and the smaller column 3,495 ounces when 40 feet high. This theorem in the laws of motion is known to every engineer. The *fountain, too, is infinitely* less liable to choke than the friction pump. For every pint of sand that Mr. G. Hallen Cottam shall put into his pump a peck of sand shall be put into my fountain, which shall then surpass his pump in effect more than cent. per cent., and leave that gentleman, and his letter at page 108, in schedule A.

W. S.

THE SHEFFIELD AND MANCHESTER RAILWAY.

Sir,—I send you herewith copies of a series of pamphlets which I have published on the subject of a railway from this town (Sheffield) to Manchester. You will perceive that, if the committee had taken the advice which I gave them in the concluding paragraph of that which is entitled "Description of the Line, &c.,"* they would have saved many thousand pounds to the company of proprietors, and the works might have been now in progress. Verily, there is an old proverb which saith "most haste, worst speed," and the truth of which hath been here exemplified; for the major part of that committee—chiefly composed of Liverpool speculators and Sheffield monopolists—were too much wrapped up in that chief of railway-engineers, Mr. George Stephenson, and in too much *haste* to get riches, to listen to advice gratuitously offered by a person of no *note*.

Howbeit, at the first general meeting of the shareholders (or *proprietors*), on the 20th October, 1831, notwithstanding the intoxicating effects of Mr. Stephenson's "Report on the *practicability* of the Line," (which it was not found convenient to bring forth till *after* the passing of the act, and the advertising of my "Appendix,") a six-months' adjournment took place for further consideration of the said *practicability*, and to give time to attempt the hopeless task of getting the vacant shares filled up. This attempt was rendered futile, chiefly by the circulation of my "Appendix," which made known more generally to the shareholders and the public, those extraordinary restrictions under which the act had been ob-

* "In conclusion, I would beg to suggest to the committees the propriety of deferring their application to Parliament till the next session; which would afford them sufficient time to reconsider the subject, and find out a better line. The Sheffield Directors must be well aware that the line adopted by the engineer, perhaps without their sanction, is any thing but a desirable one."

tained,* and the little probability there was of that act being carried into execution, under Mr. Stephenson's management, for the estimated sum of 530,000*l.*

At the second meeting (18th April, 1832,) it was resolved to permit those shareholders who wished it to *withdraw* from the undertaking, and to adjourn till the 5th of this present month;—the resolutions of which *third* and *last* meeting may be seen advertised in the *Sheffield Iris* of to-day, from which I give you the following extract:—

"Resolved unanimously,—That as it appears that the total subscriptions to this undertaking are 85,000*l.* short of the total capital required by the act of Parliament, and that, out of the shares subscribed for, 2,576 have been resigned in accordance with the resolution of the meeting held on the 18th of April, 1832, *the undertaking be abandoned*, and that the balance of the subscriptions be rateably divided amongst the subscribers at the earliest possible period."

The money thrown away amounts to nearly 18,000*l.*; but should another *act* be applied for, it is to be hoped it will not cost *one-third* of that sum. This was only a sample of the extravagant way in which the undertaking would have been carried on, if the timely depreciation of the shares had not put a stop to it. Economy is *not* "the order of the day" in *every* department; it may be so in the *lowest*, for the greater benefit of the higher grades. "Charity begins at home," and economy, or, properly speaking, *parsimony*, commences with the slave.

The unfortunate result of this mismanaged concern may serve as a warning to others engaged in similar projects, to find out *early*, by any means, however cheap or humble, *such a line*, between two given extreme points, *as cannot be afterwards improved upon*. Even to the mere speculator, who looks only for his *premium*, this is a very essential object, as the *real* improved value of such shares is invariably denoted by the difference between common interest on the outlay, and the *nett* amount of permanent revenue. Public opinion, as to the value of such shares, may be led astray for a time by false estimates, dishonest artifice, and auctioneering *puffs*, but sooner or later the sterling nature of its judgment will recover itself, and the *shares* will find their proper level in the market—if marketable they still remain. Instead of bearing the honourable *premium of ten per cent.*, as some have done at their very origin, they may become so far degraded as to be advertised for sale *at a discount*, like stinking fish; and, for want of a purchaser at *any* price, may at last be thrown away and utterly *abandoned*. Some shareholders, it is true, may escape by taking *in* their less-knowing neighbours; but then, this is undoubtedly a species of swindling,—an anti-social art which no *honest* man or *true* citizen would attempt to practise. Let us all, Mr. Editor, endeavour to live by fair dealing, and, if that will not make us *rich*, let us be contented to remain *poor*, under the consoling reflection so pithily expressed by Pope—"an *honest* man's the noblest work of God." I had no intention of moralising when I began to write, but the subject has drawn me into it unawares.

I am, Sir,

Your obedient servant,

HENRY SANDERSON, Surveyor.

Sheffield, June 11, 1833.

The pamphlets which Mr. Sanderson has been so good as to forward to us along with the preceding communication, are very creditable to his talents. They show not only a perfect mastery of the particular local subject of which they treat, but an accurate acquaintance with railway matters in general. The line which, on Mr. Stephenson's recommendation, was adopted for the projected railway between Sheffield and Manchester, took the direction of *Castleton* and Stockport. Mr Sanderson has been at pains to show, and we think has proved most satisfactorily, that a much better line, in every respect, would have been found by the way of *Saltersbrook* and Stockport. We see enough in the natural difficulties attending the execution of the former line to account for its abandonment; and

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* The restrictions were indeed extraordinary. By one clause it was enacted that the first 100,000*l.* should be laid out on the Sheffield end of the line,—the portion least likely to be productive,—and that within the first three years (this is said to have been inserted "to remove the jealousy of the Peak Forest Canal Company"); by another, the act was to become void if the railway were not completed within seven years; and, by a third, ground was not to be broken till every shilling of the estimated *cost (530,000l.)* was subscribed for. —*Ed. M. M.*

have little doubt that, had the latter been adopted, we should have had the pleasure of witnessing a very different result. The project of a railway communication between Sheffield and Manchester may, we fear, be considered as now shelved for a time; but whenever it is revived, the Saltersbrook ought to be the line (unless some still better—which is not likely—can be found), and Mr. Sanderson, its author, the person to execute it. Although but "a simple surveyor," as he says, he evidently wants nothing to qualify him for the successful execution of that or any other similar work.—Ed. M. M.

MARTIN'S "TAXATION OF THE BRITISH EMPIRE."*

Mr. Martin is of that order of politicians, happily nigh extinct amongst us, who look upon crowns and sceptres as being as much matters of lawful and indefeasible inheritance as houses and lands; and that all the liberty possessed by Englishmen "has been from the very earliest ages obtained for them by the aristocracy" (we hope he will tell us in his next edition from whom they obtained the manifold grievances they still labour under); but though apparently unfitted, by the absurdity and obsoleteness of his political notions, for doing justice to a subject so intimately connected with the question of the origin and objects of government as that of taxes, he has, by dint of much industrious rummaging among good authorities, such as Macculloch, Parnell, Thomson, Dunn, &c, and much matter-of-fact shrewdness, contrived to present us with the best *popular* work on the "Taxation of the British Empire" which has yet appeared. Mr. Martin and his book are, strange to say, in perfect contradiction to each other; the one is all devotion to the "right divine" of kings and nobles to govern as they please—the other full to sickening of the evils which this sort of governing has wrought to the people. He examines successively the operation of nearly every one of our almost innumerable taxes; and shows, past all denial, that the manufactures, trade, comforts, morals, and general welfare of the British people have all been prodigious sufferers from the rank folly and gross partiality (the patriotism and beneficence of kings and nobles notwithstanding) exhibited in the manner in which these taxes have been apportioned and levied. No one who reads the work through with attention can hesitate to subscribe to the truth of the author's general conclusion, that the *mode* of our taxation "has been tenfold, aye, one hundred-fold, more detrimental than even the amount of money raised," enormous and unparalleled as it is.

Let us take, for example, the tax on glass, one of the most beautiful of our manufactures, and calculated, from the singular cheapness of the materials, to be one of the most productive and profitable. In 1792, the tax was, on an average, 14*s.* 2*d.* per cwt., and the total quantity then manufactured, 431,070 cwt. annually; but in the course of the succeeding thirty years the tax was progressively raised to 2*l.* 7*s.* 5*d.* per cwt., and the consumption, instead of having increased correspondingly with the increase of the population and general luxury, had fallen to 378,804 cwt! That it was the rise in the tax which caused this decline in the consumption is not a matter of mere inference, but proved by many incontestable facts. Thus, when in 1795 the duty on flint-glass was raised from 21*s.* 5*d.* per cwt. to 49*s.*, the quantity manufactured fell immediately from 67,615 cwt. to 49,218 cwt.; and when, on the contrary, the duty happened to be lowered, as in 1825, from 98*s.* to 56*s.*, the quantity manufactured rose with rapidity, and in precisely the same proportion, having increased in three years from 100,067 cwt. to 190,384. The *nominal* amount of the duty, however, as will be seen by the following extract from Mr. Montgomery, is far from being the greatest evil:—

"There are thirty-two clauses, regulations, and penalties in the Act for the taxation of glass, all exceedingly vexatious to the manufacturer, and *all to be paid for by the public,* before the excised article reaches them; for if men be subjected to annoying, impolitic, harassing, and even wasteful regulations in the exercise of their trade by the stupid and perverse enactments of the Legislature, it is but natural for them to lay a heavier charge on the article sold, as some indemnification for what they have suffered. It is a pleasure to refer to the luminous observations of Mr. Thompson (the Vice-President of the Board of Trade), on this interesting subject, in his celebrated speech on taxation:—' The duty on flint glass is

* 18mo., 261 pp. E. Wilson.

6*d.* per lb.; and when made it sells for only 1*s.* But the excise-officer has the power of imposing the duty either when the glass is in the pot (and worth 3*d.* per lb.), or after it has been turned out (6*d.* per lb.). the glass when turned out gaining 100 per cent. It is found more advantageous to the revenue to exact the duty on glass in the pot at 3*d.*, and in this way the duty is raised to 7*d.* Nor is this all. The manufacturer is driven by this method to the necessity of producing frequently what he does not want. The fine glass being made from the middle, and the coarse from the top and bottom, he frequently only wants fine glass, and he could remit the flux of the coarser parts, if he had not paid the duty upon it, but of course he is unable to do so.' The whole cost of the excise to the consumer, besides the duty (which is 100*l.* per cent.), is 25 per cent; and the inconvenience and oppression from the frauds that daily take place are indescribable. These circumstances, together with the inability of the manufacturer, are rapidly causing *our complete expulsion from the Continental glass-market.*"—p. 102.

A still more striking instance of the vexatious and partial character of our fiscal system is furnished by the tax on paper:—

"The tax on this article is highly obnoxious in two points of view; first, as it affects a great number of tradesmen, whose business is, in a great measure, dependent on the manufacture and use of paper; and, secondly, from the powerful check which it gives to the progress of education, science, and knowledge, and to the diffusion of truth, by enhancing the price of books. The tax varies from 30 to 200 per cent., *ad valorem,* on the different sorts of paper; and, *as in other excised articles,* the 200 per cent. duties are paid by the coarse paper, which is consumed by the middle and lower classes of society, and the 30 per cent. tax by those who use the finest description of paper! Writing, coloured, or wrapping paper, cards, and pasteboards, pay 3*d.* per lb. duty (28*s.* per cwt.;) this is called first class. The second class paper must be made wholly of tarred ropes, from which the tar has not been extracted; the tax on it is 1½*d.* per lb. (14*s.* per cwt.); but if the materials used in the second class paper be formed into millboards or scaleboards, a tax is then levied to the extent of 2¼*d.* per lb., or 21*s.* per cwt. This is a precious specimen of legislative interference with a most important branch of trade. Independent of the oppressiveness of the duty, can any thing, as Mr. Macculloch justly observes (in his valuable "Commercial Dictionary"), be more preposterously absurd than to interdict the manufacturer of wrapping paper from using any other material than tarred ropes? Tarred ropes, since the more general use of chain cables, have become every year dearer, while the material rejected in sorting the rags for the preparation of fine paper is rendered quite useless, as wrapping paper made from it would be subjected to an additional tax of 14*s.* per cwt.

"But it is not merely the amount of the tax that is alone to be deplored; the excise regulations are of so annoying a nature as considerably to enhance the prime cost of the article. 'The laws,' says a correspondent of Mr. Poulett Thompson, 'are so scattered and confused as to render it almost impossible for any body to have a knowledge of them; and frequently what is a great annoyance to an honest man is no check to a rogue. They confer almost unlimited power on those who have the administering of them over the property of all who come under their influence.' Another manufacturer says, 'We are bound to give 24 or 48 hours' notice (according to the distance the exciseman lives), before we can charge any paper, and to keep it in our mills for 24 hours after, unless it has been reweighed by the supervisor. We must have the different rooms in our manufactories lettered; moreover, engines, vats, and presses numbered, and labels pasted on each room; should we lose one label, the penalty is 200*l*!'—'I (continues the manufacturer) generally write a request for 500 labels to the Excise at one time, and should any one get into my mill and steal or destroy them, the penalty would be 100,000*l.* sterling.'

"The manufacturer must have a yearly license; a mill with *one* vat pays as much duty as a mill with *ten* vats; there are most vexatious and very numerous provisions as to entries, weighing, sorting, folding, labelling, removing, &c., and such ruinous penalties attendant on any infraction, intentional or unintentional, of the Excise regulations, that if the whole community in the United Kingdom were subject to them, they would not be borne with for one week. Taxation and oppressive enactments have in this, *as in every other article,* checked consumption. Mr. Colquhoun, in 1813, estimated the value of paper annually produced in Great Britain at 2,000,000*l.* sterling; Mr. Macculloch values the quantity made in the United Kingdom, in 1831, at 1,200,000*l.*, which is produced by 700 paper-mills in England, 80 in Scotland, and not more than 8 or 10

in Ireland; about 25,000 individuals are engaged in the trade, and the excise-duty (or, as it ought always to be termed, tax,) amounts to *more than three times as much as the total wages of the work people employed.*

"The baneful effects and, indeed, manifest injustice of levying a tax on the material of which books are composed, will be fully admitted when it is known that one book in three, and nineteen pamphlets in twenty, do not pay the expenses incurred in their publication. Thus, whether the publisher sells a dozen copies out of an impression of 500, or whether he sells the whole impression, the duty is alike levied upon him; and, indeed, he must meet the demand of the tax-gatherer before he offer a copy of his wares for sale; and the tax on a thousand or two thousand volumes is levied when perhaps not fifty have been sold.

"No modification of this iniquitous tax would benefit the public; were the tax even reduced to half its present amount, the *surveillance* of the exciseman would remain: a substitute must, therefore, be found for the 756,139*l.* a-year now levied on this ingenious and indispensable part of our national industry."—pp. 92—96.

It is such destructive intermeddling with the pursuits of industry as these extracts display, and as is, more or less, exemplified in almost every other branch of our taxation, which makes politicians of even the most passive amongst us,—which causes the scholar to emerge from his study, the student to throw aside his books, the chemist to abandon his crucible, to take an active part in the struggle for a better order of things. Men are not difficult to reconcile—and none less so than men of science, who are usually peaceful in the proportion that they are scientific—to a large amount of taxes as long as these taxes are levied out of their abundance; but hard it is to persuade any man, whether philosopher or peasant, that he is not as unwisely as tyrannically dealt with, when he sees the public tax-gather exerting himself to the utmost to thwart and hinder the production of those very means out of which his demands must be paid. Should ever a time arrive when the interests of the people and the interests of the revenue are regarded as one and the same (as they ought to be), we may expect to see all that Mr. Martin contends for, in the following brief but pithy summary of his views of financial reform, realised:—

"*All taxes which impede our internal manufactures, industry, and morality, must be abolished.*"—p. 238.

The greatest drawback on the utility of Mr. Martin's book is the view which he takes of the Corn Laws. He denies that they impose any tax whatever on the community; and maintains, on the contrary, that they are equally beneficial to the consumers and to the producers. The absurdity of this opinion needs no demonstration. If, as the patriotic Earl Fitzwilliam lately asked in the House of Lords, the object of the Corn Laws be not to keep up artificially the price of corn, of what conceivable use are they? And if they make bread dearer than it would otherwise be, do they not literally impose a tax upon bread? There can be no fairer way of ascertaining what the amount of this tax is than by contrasting the price of bread in England with the price in other countries where no such laws exist. The price of the finest wheaten flour in the London market was very recently 50*s.* per sack of 280 lbs. Now, in Paris the same number of pounds of the best wheaten flour can be purchased for 29*s.* 9*d.*, or about two-fifths less. In other parts of the Continent the price is still lower; for France is only as compared with England a cheap corn-producing country. What Mr. Martin, therefore, regards as "no tax" is, in point of fact, equivalent to a tax of 40 per cent. on the entire produce of the country; a tax far exceeding the amount of all the other taxes put together, and imposed not for the sake of the public revenue, but for the sake of the landowners alone, that is to say, some 75,000 individuals out of a population of 25,000,000.

FIRE-ESCAPE.

Mr. Editor,—I lately showed at several of the Police and Fire-Enginemen's stations, an apparatus for putting up a rope or rope-ladder to a person in a chamber-window, to enable him or her to escape in case the lower part of the house was on fire. It was simply two long poles; one had a ferule, which enabled a person to join them, and they were so tight that a person might run with them. I presented it to Mr. Thomas, of the Covent Garden Police station, who, as well as several of the police and firemen, thought it might be of use in some cases. One of the fire-

men told me they always carried a pole and rope, and had they a pole and ferule they would have the apparatus complete. It occurs to me it may be worth suggesting, that as every house in a street must be joined by another, that it would be an easy way to throw a rope to a person in the house that was on fire from the nearest window, on the same level, in the adjoining house.

I am, Sir, yours, &c.,

C. W.

THE PATENT LAWS.

The Bill brought in by Mr. Godson, for the amendment of the Laws respecting Letters Patent, the merits of which were fully discussed in our Journal of the 13th and 20th April last, was, in its progress through the House of Commons, split into two Bills, one of which took the title of "A Bill to amend the Laws respecting Letters Patent for Inventions and to secure the Property therein to Inventors;" and the other, "A Bill to further amend the Laws respecting Letters Patent for Inventions, and to settle the Practice and lessen the Expense of obtaining the same." The former of these Bills has been read in the Commons a third time and *passed;* the latter was, on the motion of Mr. Godson, put off for six months, that is, in plainer English, altogether abandoned. With respect to the Bill which has passed the Commons we should like to be able to speak well of it, for it is to be presumed that most of the parties who have been instrumental in carrying it through the House mean well; but truth compels us to declare, that it is altogether as faulty—we had almost said villanous—a piece of work as ever was elaborated, even within the walls of St. Stephen's. Instead of a Bill "to amend the Laws respecting Letters Patent for Inventions, and to secure the Property therein to Inventors," it should have been styled a Bill "to unsettle and perplex the Laws respecting Letters Patent for Inventions, to secure to rich men exclusively the property of their Inventions; and, finally, to throw open the whole arts and manufactures of the country to a grasping and ruinous system of monopoly." We have neither time nor space, this week, to prove in detail the correctness of the view which we take of the measure; and *it is not impossible that,* before another eight days, it may experience such a handling from the law Lords in the Upper House as will render the resumption of the subject unnecessary. For the present it must suffice to say, that the Bill which has been passed, not only includes all that was most absurd and ridiculous in the Bill as originally introduced by Mr. Godson—for a full exposition of the merits of which we must again refer the reader to our strictures of the 13th and 20th April last,—but much that is *a great deal worse.* We sent copies of those strictures of ours to several active members of the House of Commons, in the hope that, in some one or other of them, the poor inventor might find an advocate, and the true interests of the country an enlightened assertor; but it would seem, from the easy progress which the Bill has made through the House, either that our strictures were deemed groundless, or that they had not the good fortune to obtain the attention which they merited. We shall take equal care that the House of Lords—or, at least, the influential men in it—are apprised of the true nature of the Bill; and should it, nevertheless, also obtain the sanction of that House, we shall, even then, not cease from our endeavours to have the rights of inventors placed on their proper footing, but proceed forthwith to do our utmost to have the stain, which the Act will have inflicted on English legislation, wiped out.

STEAM CARRIAGES—CONDENSATION OF AIR.

Sir,—It is very candid in "Saxula" to acknowledge that difficulties exist to the exclusion of *swift* travelling with economy on common roads. I hope this admission will engage the attention of those who have so long, as I conceive, misemployed their time, and misapplied their talents, in the pursuit of a chimera.

That sufficient power may be obtained to drive a carriage at the rate of from five to five-and-twenty miles per hour, it were absurd to doubt; but if that power cannot be advantageously employed, is it not valueless as an article of commerce?

A rapid movement in a locomotive machine necessarily implies an excess of power as compared with the mass of the materials by which that power is generated and directed. How are these contraries to be reconciled?

"Saxula" says he has been to Utopia. I congratulate him on his safe return; and

I am glad that he appears not to have suffered either in health or spirits. Did he take care of his pockets during his sojourn in that part of the country?

"Saxula" will do good to many who cannot afford to leave their homes, if he will tell them a little of what he has seen and heard in Utopia. It is a fine place to gain experience; but the mischief is, that when acquired it very often proves too costly for common purposes.

With every expression of respect for Mr. Cheverton, and with becoming deference to his opinions on some subjects, I cannot assent to his conclusions in reference to the condensation of air or gases. The only prejudice that exists in my mind —at least, I hope so—is in favour of truth. I wish Mr. Cheverton would look at the subject again. If he still holds that the effect described is entirely due to the contractibility of the metal, I will give him hereafter my experiments in detail. Is he open to conviction? So am I.

J. O. N. Rutter.

July 2, 1833.

A SUBSTITUTE FOR THE UNDULATING RAILWAY.

Sir,—Allow me to suggest, as a substitute for undulations in a railway, that the wheels of the ordinary carriages be made with the axis a little removed from the centre. The effect will be an undulating motion on a level road, possessing all the *advantages* of the same motion on an undulating road. The principle is equally applicable to all descriptions of vehicles, carriers' waggons, stage-coaches, omnibuses, gentlemen's carriages, timber-carriages, wheelbarrows, horse-artillery, &c.

We, of physic, are accustomed to look up to the science of mathematics as the perfection of exactitude; unless, however, its professors can decide by calculation the comparative value of an undulating and a level road, it must cease to maintain its high character. Facts may, in time, determine it; but what are called facts in the present day are *not* stubborn things, for there is scarcely a disputable point of which both sides may not be *apparently* substantiated by facts.

I am, Sir, yours obediently,

M. D.

Sunderland, July 5, 1833.

MESSRS. HEATON BROTHERS' STEAM-DRAG.

[*Extract of a letter from Messrs. Heaton Brothers to the Editor, dated Birmingham, July 17, 1833.*]

"We yesterday made another journey with a light waggon, on springs attached to our steam *drag, in which was seated* twenty-two persons, and three on the steam engine, in all twenty-five persons. The journey, thirteen miles, was performed in one hour and fifty-six minutes, sixteen minutes of which time was occupied in taking up and setting down persons at various places, and in taking in about sixty gallons of water at the middle of our journey. We arrived at Wolverhampton, with all in good condition (to the best of our knowledge), took in water and about six bushels of coke, a sufficient quantity for our journey, and started back; but before we had proceeded four hundred yards we perceived, to our mortification, that one of the stays to the shaft that turns the hind wheels had broken, being made too light. We returned by the steam power to the place from which we set out, repaired the breach, and started afresh, when we came along as well as we went; but, in coming down Soho Hill, one mile and a half from home, we had the misfortune to twist our main shaft, which is in connexion with the engines, which arose from its having been made for five inch cylinders, and being, therefore, only one and a half inch thick, whereas the cylinders of the present engine are seven inch cylinders, with a twelve inch stroke. We shall repair the damage, and make some few alterations that we think necessary, when we shall make another experiment, of which we will send you the particulars, together with a sketch, and some description of our machine."

THE UNDULATING RAILWAY.

Sir,—In consequence of a letter which I have received from Mr. R. Stephenson, jun., dated the 6th inst., which explains, in a most gentlemanlike manner, to my entire satisfaction, that the remark made by "*A Subscriber to the Birmingham Railway*," in your Number of the 1st June, was altogether unauthorised by him, I take this opportunity of withdrawing the challenge which, in your Number of the 29th June, I especially and pointedly directed to him; at the same time wishing it to be understood, that, in general allusion to the scientific world, my challenge, dated the 31st May, is not withdrawn.

I am, Sir, your very obedient servant,

Richard Badnall.

Farm Hill, near Douglas, July 15, 1833.

INTERIM NOTICES.

T. D.—The reserve of R. C. of Utica, on the subject of Indian Corn Malt, has been liberally compensated for by a letter from another American, Duty D. Dubikins, for which we shall endeavour to find a place in our next.

M. M. M.—There was at one time a Mechanics' Institution in Southwark, but we have heard nothing of it for a long time. It has, we fear, like most of the suburban institutions of that description, gone to decay or become extinct, from not being sufficiently adapted to the wants of mechanics.

"A Subscriber from the First" is very angry with F. H. for insisting that the Liberia Colonisation scheme is a humbug. He must know, however, that this is an opinion which F. H. shares with a great many highly respectable individuals; and he must know, also, that his friend, Mr. Cresson, has not met the charges against the plan in the only way in which they can be satisfactorily rebutted.

Communications received from Mr. Booth—Mr. Chanter—C. S. C.—R.—W. W.—Mr. Badnall (10th July)—A. R.—J. B.—M. D.—Mr. R. Witty.

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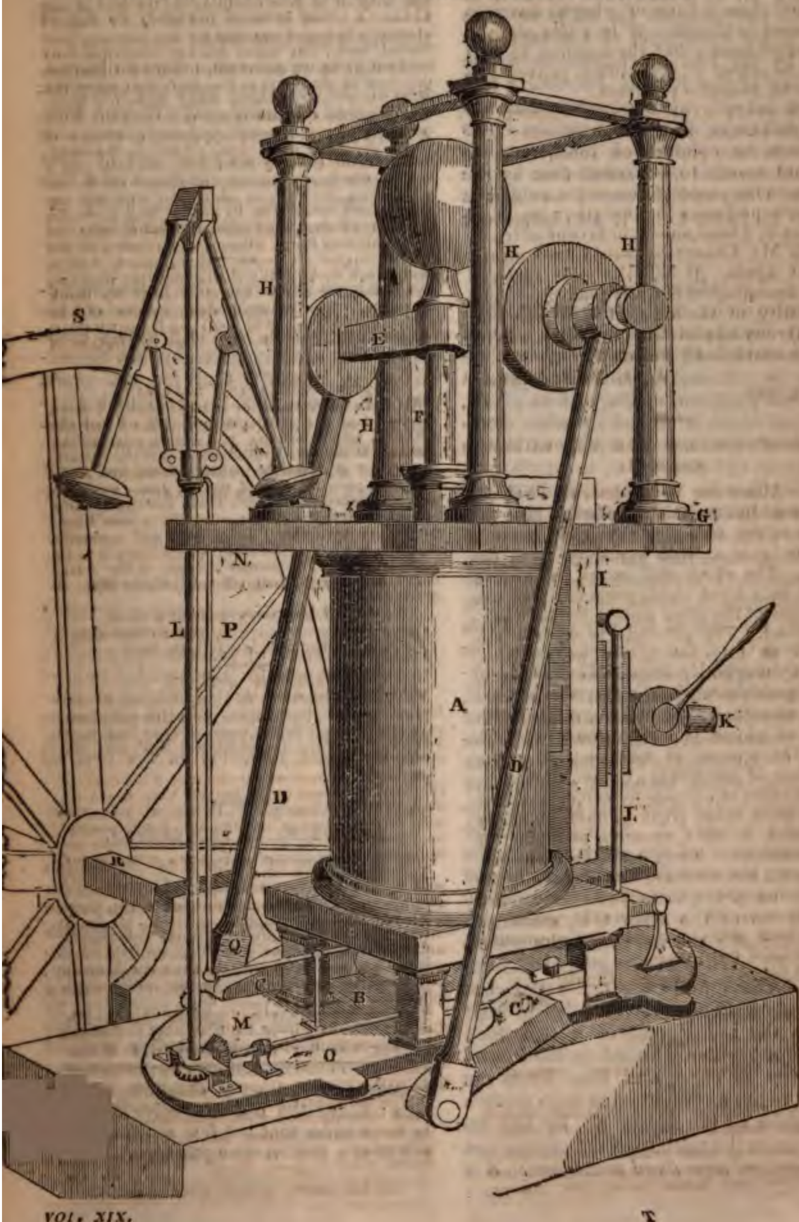
DIETZ'S STEAM-ENGINE, WITHOUT LEVER BEAM.



DESCRIPTION OF DIETZ'S STEAM-ENGINE WITHOUT LEVER BEAM. BY THE INVENTOR.

Since the insertion of our correspondent Mr. E. J. Somerville's account of Dietz's steam-engine (p. 225), we have met with a description of the same engine by the inventor himself in a late Number of the *Recueil Industriel;* and as it is not only more complete than the former, but exhibits the machine in its most recently improved form, and as manufactured *at the present time* by the firm of Dietz and Hermann, we think it due to M. Dietz to lay it also before our readers.

Description.

The cylinder A (see engraving, front page,) constitutes the principal part of the machine. It is of cast iron, enveloped in an iron casing, and fixed upon a cast iron platform, resting on four pillars, between which is placed an arbor (composed of hammered iron), with two cheeks or end-pieces C C, to which end-pieces the two upright rods D D are adapted by means of slip-collars and wedge-pins, in order that they may be tightened when they get slack from use. The rods D D are attached at top to the traverse-beam E, to the centre of which is fixed the rod of the piston F. From the cover G of the cylinder A rise four iron cylindrical columns H H H H, between which works the traverse-beam E, so as to preserve the vertical movement of the piston-rod F. Connected with the arbor C C, under the cylinder, there is an eccentric, which transmits a to-and-fro movement to the slide I, by the intervention of two rods J J. K is the cock for the admission of the steam. L is the governor, supported by the stay N, affixed to the cover G; it is put in motion by the action of the arbor C C, communicated through the rod O and the wheel-work M. When the motion of the engine inclines to be too rapid, the centrifugal action of the balls of the governor raises the rod P and lever Q, which causes a register adapted to the induction-pipe to close, and thus forces the steam to act on the piston so as to slacken the speed of the machine. By this arrangement the velocity of the engine can *never exceed* any fixed maximum. S is the fly-wheel; and R its axle, which is connected by an elbow-piece to the arbor C C. T is the mass of masonry on which the whole machine rests.

It will be at once seen from an inspection of the engraving that the combination in this engine is new. One of from 4 to 10 horse power occupies a space of only three feet by six; and one of from 12 to 20 horse power, a space of 4 feet by 8; both spaces, of course, being exclusive of that occupied by the boiler.

We have left out of the preceding description M. Dietz's description of his expanding piston, as it is precisely similar to that already given by Mr. Somerville. It is stated that for six years, during which Messrs. Dietz and Hermann have been in the habit of supplying pistons of this description to steam-engines and water-pumps, they have not once had occasion to make any repairs or alterations in them.

NEW METHOD OF GAS MAKING.

A project is on foot, indeed it is stated to be nearly completed, for so far simplifying the process of gas-manufacturing as to render it easy for the parishes to provide for their own lights, instead of contracting, as at present, with the great companies. The improvement will, no doubt, effect a great reduction in the cost of gas.—F. H.

SYMPTOMS OF PROGRESSION.

The number of visitors to the British Museum has been rapidly increasing for some years. Those parts open to the public (all except the library) are now generally crowded,—a fact which may be readily believed when it is stated, that on Monday, July 8, alone the number of visitors amounted to no less than 3,109. This result is to be attributed not only to the taste for science having become more generally diffused among all classes, but also to the greatly-increased facilities for obtaining admission: under the old restrictive system it is no wonder that but few availed themselves of a cumbersome privilege.

F. H.

FURTHER ACCOUNTS OF THE OPERATIONS NOW IN PROGRESS IN DEMERARA, FOR OBTAINING PURE RAW SUGAR DIRECT FROM THE CANE JUICE.

(Communicated by ABRAHAM BOOTH, Esq., Lecturer on Chemistry, &c.)

In a former Number* I communicated to the readers of the Mechanics' Magazine the important results of trials which had then recently been put in operation in Demerara for obtaining pure sugar direct from the cane juice, with the immense advantages gained to the planter by the improved process of carrying on the evaporation in vacuo. Since that period the importance of this improved plan of operation has been adequately confirmed; and I have now the pleasure to forward to the notice of the readers of that invaluable journal, details which cannot fail to convince the most sceptical, and, even in the confusion of political partisanship, must be considered by all who are interested in the welfare of the colonies, to be the only true mode of revivifying the spoiled fortunes of the planters, and restoring prosperity to these important appendages of the British Crown. The period cannot be far distant when this improved sugar will wholly supersede the use of refined for all domestic purposes; and that branch of domestic industry, which has so long suffered under the severest privations, must submit before one of those improvements which the discoveries or applications of science occasionally impress when minor interests are sacrificed to the general good.

From the Royal Gazette of British Guiana, Georgetown, Saturday, Nov. 24, 1832.

TO THE PLANTERS OF BRITISH GUIANA.

Gentlemen,—Notwithstanding the favourable manner in which my former communication was received, and the attention bestowed upon the subject, I feel considerable diffidence whilst addressing so large and respectable a body as the planters of British Guiana; that diffidence is increased by a fear lest it might be deemed presumptuous in an humble individual to treat of a subject so important and so intimately connected with your interests as the manufactute of your staple production.

Nearly two years have elapsed since I first had the honour of introducing to your notice a new and scientific process of converting cane juice into sugar by evaporation in vacuo by the agency of steam. I endeavoured by a short synopsis to convey an idea of the principle upon which the system is founded, the apparatus employed, and the mode of operations pursued upon its first introduction into this colony. The successful results of an attempt to apply the same principle and means to the original process, which had hitherto been exclusively confined to the refineries, wherein it had previously been employed for many years, and had contributed so largely to the welfare of individuals, surpassed my expectations, and confirmed the opinions I had long entertained, that the establishment of the same mode upon sugar plantations would be productive of the same profitable results to their proprietors.

Under the impression that the new system is still but very imperfectly understood, and that much misapprehension prevails upon the subject, I beg leave, as its representative in the colony, to bring it again before you; and whilst most respectfully submitting my observations to your notice, I ask credence no farther than I am supported by proofs, most of which are within the reach of every gentleman who may be disposed to investigate the subject.

The introduction of a new principle or mode of operation, in any branch of manufacture, is almost invariably attended with difficulties. However perfect the theory, its practical application is often rendered imperfect in its results by the operation of causes the very existence of which is, perhaps, not known until we are called upon to encounter them. This was very fully exemplified with regard to this system upon its first introduction into the refineries at home, where, like all other innovations upon established customs and usage, it had to win its way by the force of its own inherent merits against the predilections of those who, after having acquired skill in the old process, were unwilling to strike out into new paths.

Since the period that publicity was first given to the introduction of the vacuum-pans, and the mode of operations in this colony, some modifications have been introduced and improvements suggested by practical experience. We have

* Mech. Mag., July 28, 1832.

been taught to attach less importance to some minor operations which were originally embraced within our view, and ultimately to abandon them for the present. This, by enabling us to dispense with a considerable part of the apparatus, has had the twofold effect of diminishing the cost of the utensils and simplifying the process. This has been accomplished without sacrificing the advantages offered to the planter by the adoption of this system, which can with confidence be stated to be the facility of making a better sugar, and in a greater quantity, than by any other mode yet discovered, and without any augmentation of the current expenses of the estate. Though the making this allegation, and perseverance in the maintenance thereof, has brought me into collision with the opinions of some gentlemen, and may not accord with actual results in some instances, yet those of a more recent date afford undeniable evidence of its truth, and have forced conviction on the minds of many who had previously been swayed by a contrary sentiment; and I flatter myself that a better acquaintance with the system is all that is wanting to establish its reputation.

If difficulties have arisen in practice in some cases, and the full development of the advantages to the extent to which the system is susceptible has not been uniformly experienced, it must be ascribed to the operation of causes of a local and adventitious nature. Different results being produced where these did not exist, proves that they are not the necessary concomitants of the system.

The manufacture of sugar in the colonies has hitherto received little or no aid from science, though essentially a chemical process; and although it has become so important an article of commerce and manufacture, it still retains the features of the rudest simplicity. But this simplicity, so far from being an objection, would perhaps be a powerful argument for its continuance, did it not involve a destructive principle that exists to an extent, and subjects the planter to a positive loss, far greater than many are aware of. This principle is the excessive heat unavoidably applied in the process of evaporation in the teache, where the long exposure to the direct action of an intense flame (the temperature of the liquor con*tinually augmenting* as the concentration *advances) has the effect* of preventing the full formation of the crystals, and of converting a portion of the crystallisable syrups into molasses. The crystals are prevented from acquiring above one-eighth of the size of which they are susceptible, and become so chemically combined with the carbon created by the high temperature to which they are subjected, as to render the complete separation of the pure sugar from the molasses and colouring matter impracticable without being again reduced to a fluid state, and submitted to a second process in the hands of the refiner, whose business it is to remedy the defects and repair the injury of the first process. The quantity of the most delicate portion of the saccharine actually destroyed, and the deterioration of the article, constitute but a part of the planter's loss.

If, as is generally acknowledged, excessive heat, or, technically speaking, high temperature, is the cause of so much injury, it follows as a necessary consequence that its disadvantageous effects will be lessened in proportion as this temperature is reduced. The evaporation of all fluids, as is well known, is retarded by the pressure of the incumbent atmosphere preventing the free ascension of the vapour, to counteract which the expansive power of heat is required in proportion to the density of the substance or fluid; but if the atmospheric pressure can be removed, it is evident that a diminished heat will be adequate to produce the same result. Hence the invention of evaporation in vacuo, long known to chemists, but not applied beyond the walls of the laboratory to purposes of general utility upon a large scale, until the Honourable Edward Charles Howard, after many experiments, succeeded in bringing it into successful practice in the hands of an eminent refiner in London, who enjoyed a fourteen years' patent and amassed a princely fortune as the reward of his enterprise.

Taking it for granted that those gentlemen who may have taken any interest in this improved system in the colony have made themselves acquainted with the general description of the apparatus, I will not trespass unnecessarily upon your indulgence, but proceed to give an outline of the process upon those two estates where it is in its most successful operation. The mode and results are principally distinguished by the one pos-

sessing the pneumatic-pump in addition to the vacuum-pans, for the purpose of effecting a more complete and rapid expulsion of the molasses; whereas upon the other estate the sugar at present is cured in the usual manner, without recourse to any artificial means.

At plantation Richmond, the liquor is evaporated in the boilers, being cleaned and skimmed as usual, until it has acquired a proper degree of consistence, when it is conveyed by dipper and trough into receiving cisterns, and from thence to the vacuum-pans as required. Here the process of granulation is commenced and completed under the very diminished temperature of from 150° to 155°, as indicated by a thermometer fixed in the upper part of the pan; the vacuum formed and maintained in the pan is also indicated by a barometer, in which the mercury usually stands at 26 inches. The pans being worked by the agency of steam applied externally, the degree of heat, as well as the exhausting power of the air-pump, are regulated by valves, which place the application of both under the control of the person superintending the process, the progress of which is ascertained by the abstraction of a small quantity of sugar from time to time for that purpose, by means of an ingenious instrument, which is technically termed taking proof. The pans are placed upon an elevation of eight or nine feet, and under them are the pneumatic vessels for curing, these being large rectangular iron boxes, containing a strainer of metallic gauze.

When the granulation is completed in the pans, the sugar is discharged by a plug into the said curing-boxes. When filled, the valve commanding the air-pumps is opened, and the space below the sugar being rapidly exhausted of the air it contains, the pressure of the incumbent atmosphere expels the molasses, after two or three repetitions, and leaves that beautiful large and transparent crystal sugar so much admired in the colony, where a considerable quantity is sold for home consumption, both in its natural form and in stamped loaves, equal to the best refined in Europe. This mode of curing by atmospheric pressure is now confined to sugar made in the vacuum-pans, the size and hardness *of the crystals enabling* the sugar to *undergo the pressure* which is used in this process. Its advantages are threefold: first, in the dispatch with which the molasses are completely expelled, not occupying more than an hour or two for the day's work; secondly, in ensuring uniformity of quality; and, thirdly, the saving of all the molasses, which in common sugars is entirely lost to the planter, by drainage during the passage home, in the warehouses, &c. Sugars so cured only require a few hours for drying previous to shipment. They command a ready sale at 70*s*.

A scientific gentleman in Georgetown, being desirous of ascertaining its relative value as a chemical extract, compared with sugars made in the usual manner, found, by experiments made upon equal weights of each, that the vacuum-pan sugar contained one-eighth more strength and saccharine than the other; and further that, under the same circumstances, the latter fermented in four days and became acid, whereas the former shewed no disposition at the end of eight weeks, thereby proving the absence of all fermentable matter, a desideratum in sugar of the greatest importance. But if any thing were wanting to prove the superiority of this sugar above any hitherto made in the West Indies, the circumstance of its having been repeatedly seized in the ports of London, Liverpool and Bristol, under the mistaken impression that it was refined sugar, and the great difficulty with which this impression was removed, and the sugar liberated, must be conclusive. This could only be effected by the production of proof that it really was no more than Muscovado made by a new process, upon being satisfied of which, it was decided to admit it upon payment of the same duty as ordinary sugar.

The results upon plantation Richmond may perhaps be termed the *ne plus ultra* of the manufacture of sugar, *which, growing in the field in the morning, is converted into a beautiful white sugar in the evening*, receiving under the hands of the planter that perfection for which it has hitherto been indebted to the refiner.

Upon plantation "Land of Plenty" the mode is more simple, being at present limited to the principle of boiling in vacuo, the pneumatic process of curing not having as yet been introduced. There are two pans, the same in every respect

as those at Richmond, and placed upon a similar elevation; the liquor is prepared in the same manner, and the granulation completed in the vacuum pans; it is then discharged direct into the hogsheads, placed in the curing house immediately below, and left to drain or cure without any further trouble, or the employment of any chemical mixture or ablution whatever, and is generally ready for shipment in a few days. The sugar produced is equal in size, hardness, and brilliancy of the crystals, differing only in colour with that made at Richmond, which has been subjected to the pneumatic process of curing, but both possessing that strength, durability, and boldness of grain which stamps its value in the market. As the distinction between the results upon the two estates consists in the degree to which each sugar is cured, the difference in the quantity or weight produced will be in the same ratio. Which mode may ultimately be found most advantageous, must be decided by the prices each quality can command, compared with the quantity produced.

The colour and transparency of sugars, in general, I consider to be determined in a great measure by the quantity of carbon combined with the syrup during the process of concentration in the first instance, and, ultimately, by its freedom from or retention of molasses—in other words, by the circumstance of its being more or less perfectly cured.

The mathematical precision of their construction, and full development of the crystals of sugar made in the vacuum pans, are proofs of the excellence of the process as a chemical result; and that the mucilaginous colouring matter, which forms so large a portion of the educt of cane, has not entered into combination with the pure sugar, is shewn by its transparency when divested of the molasses, which adheres to the surfaces of the crystals.

That the vacuum pan really possesses the property of producing a heavier extract from a given quantity of liquor, was fully demonstrated by a circumstance not very generally known. Those refiners who work upon foreign sugars, such as Havannah and Brazils, are *required* by the legislature to export the *sugar so refined.* The weight was calculated *by the average* of the extract obtained by the process in the old way of refining in open pans, and the result was 63 lbs. of refined sugar from 1 cwt. of Muscovado. The substitution of the vacuum pans produced 78 lbs. per cwt., consequently, while this remained unknown, the refiner retained 15 lbs. for home consumption, to the exclusion of an equal quantity the growth of our own colonies.

The proportion which sugar bears to the cane juice from which it is produced, depends upon so many contingencies, the richness or poverty of the latter being governed by the quality of the soil, the seasons, &c., as to render it a matter of difficult and uncertain calculation; but from observation, and the concurrent information I have been able to obtain, I consider myself warranted in stating that an increased weight, varying from one-seventh to one-tenth, is obtained by this system above what can be obtained by any other process yet discovered—I mean of sugars cured in the usual manner.

Amongst the misapprehensions that have existed concerning this system, *there is, perhaps, no greater error than the idea that the advantages of enhanced price and greater weight obtained by this process are counterbalanced by increased labour, and the consumption of fuel, added to the original cost of the apparatus, &c. &c.* Upon the two estates more particularly alluded to, the steam boilers being hung upon the last most excellent improved principle, whereby the steam is generated by the same fire that is required under the coppers, without any additional fuel, that important article no longer forms an item in the current expenses of the estate. To the inventor of this system of hanging the steam boilers the planter is indebted for this saving, which is rendered still greater by the diminution of the hours of labour in the boiling house on the vacuum principle. Upon "Land of Plenty" the time heretofore occupied, and the labour of the hands employed in curing, is entirely saved. They can make four hogsheads of sugar with ease between daylight in the morning and six in the evening. I feel a satisfaction in being enabled to submit this system to your notice, under more propitious circumstances now than upon its first introduction to the colony. The intervening time has been

productive of events that have served to remove the problematic character of the first experiments. Though all acknowledged the superiority of the sugar, yet that very superiority created a doubt in the minds of some lest the legislature should, by subjecting it to an additional duty, neutralise the advantage that the planter ought to reap from the adoption of this scientific mode; others entertained fears *that it would not stand the voyage home, and the variations of the atmosphere*. These points are now set at rest: it is finally decided that the vacuum-pan sugar shall be admitted into the British market at the same duty as all others. The vacuum-pan sugars have become known in the principal markets, and their value appreciated. I have by me some sugar made on plantation Richmond in January last, which has been home and sent out again that it might be ascertained what would be the effect of two voyages across the Atlantic. It is as good as on the day it was made. Estates may now adopt this system with not only more certainty of success, but at a very diminished expense, compared with what was incurred by those gentlemen who first made the experiment. A better acquaintance with the various incidents attending the introduction of the vacuum pans, has enabled me to adopt general arrangements to existing circumstances.

If, gentlemen, I have already encroached too long upon your time and attention, it has been under the impression that, however imperfect may be the general outline I have endeavoured to give of this system and its results, the subject, bearing as it does so directly upon your interests, will not be thought altogether indifferent—assured that whilst your revenue is derived from the cultivation of the cane and its conversion into sugar, any proposition for the improvement in its manufacture, that is calculated to yield a better profit to the planter, will meet with an attentive consideration.

I shall feel happy in affording any additional information, or explaining any points that may not be deemed sufficiently clear, to those gentlemen who may honour me with their communications.

Letters addressed to me may be left at the counting-house of John Gibbs, Esq., or may be addressed to Messrs. W. Oaks and Son, of London.

I am, gentlemen,
Very respectfully,
THOMAS DODSON.

November 24, 1832.

These interesting and intelligent details of Mr. Dodson are introduced in the following sensible and judicious editorial remarks:—

"In our columns of this evening's impression will be found an interesting and important letter from Mr. Dodson, of the house of Messrs. Oaks and Co., of London, the gentleman who, about two years ago, introduced the vacuum pans for improving our staple commodity. The subject, to us, appears to involve a question of the highest importance—no less than that of rendering the manufacture of sugar as perfect as the nature of it is susceptible of being made.

"The complete success of the vacuum-pan process on plantations Richmond, and "Land of Plenty," where it has been uninterruptedly carried on for several months past, and is still in full operation, is, we consider, ample proof of its fitness to accomplish an hitherto unattainable desideratum in this important branch of colonial product.

"We are aware that the introduction of every new process, however evident the improvements may be, has to encounter innumerable obstacles ere it becomes successfully established. Amongst these obstacles, a deep-rooted prejudice for the old system is the most formidable; but facts, pregnant with ample profit, must ultimately prevail, and we hope the time is not far distant when we shall have the satisfaction of witnessing the perfection of the manfacture of this article on every estate in the colony.

"As the Commissioners of Customs have decided, that the crystallised sugar recently introduced shall be admitted into the British market at the same rate of duty as the Muscovado, it is not, we trust, anticipating too much to expect that the planters in general will avail themselves of an advantage of at least 10*s*. an hundred weight in price, to say nothing of the reputation which the colony will gain by sending sugar of the first quality into the market, whilst a few years ago Demerara sugars bore the lowest grade in the price current, at the

same time it paid an equal rate of duty for the inferior quality as is payable on the crystallised sugar.

"In hazarding these remarks we are actuated by no other motive than that which emanates from an earnest desire of being instrumental in calling the attention of planters to a subject that concerns their immediate interests in a way no one can mistake, as it is confined to the limits of arithmetic, and is easily ascertained by a simple appeal to the costs of outlay for the requisite apparatus, the additional labour (if any) in making the sugar, and the price it will command in the market."

Extracts of Letters addressed to Mr. Dodson.

Land of Plenty, Nov. 4, 1832.

Dear Sir,—Your letter of the 7th inst. came to hand a few days ago; I shall have much pleasure in complying with your request, and answer your several questions, as far as my judgment will allow. Having made several calculations and paid much attention generally to the process of boiling in vacuo, I trust I shall be found tolerably correct. I am certain that every individual concerned on this estate in manufacturing sugar has no reason to regret the erection of the pans, as they all see how much their labour is lessened by the use of them. Annexed you will find your questions, with my answers placed opposite.

I remain, dear Sir, yours truly,

HENRY GULLIFER.

1st.

Is the sugar made in vacuo superior to that made in the teache? If so, in what does that superiority consist?

1st.

It is very superior in strength and colour, and nearly the whole of the sugar in the hogsheads is of the same quality; and I am of opinion the casks will weigh as much in England as they do here.

2d.

Is the quantity so made greater than in the ordinary mode? If so, what may be the proportion?

2d.

In all my calculations I have found by boiling in vacuo that 90 gallons of raw cane juice will make 100 lbs. of sugar. This is about the average of 100 hogsheads we have made; and I am certain that had we made three times this quantity in the ordinary way, it would have taken from 125 to 140 gallons to the 100 lbs. of sugar.

3d.

Is the operation completed in a shorter time? If so, what may be the difference?

3d.

It is completed in a much shorter time. The difference is at least three hours.

4th.

Is the labour in the buildings lessened? If so, in what manner and to what extent?

4th.

The labour in the buildings is lessened by taking the sugar immediately from the pans into the hogsheads, instead of carrying it in pails to the curing-house. In the field, the labour is considerably lessened. I consider where *twelve* hands cut canes for one hogshead of sugar in the ordinary way, *nine* hands would supply canes with ease for the same quantity boiled in vacuo, and so in proportion as the canes may be required.

5th.

Does the new system require more fuel? If so, how much?

5th.

This depends much on the situation of the engine-boilers. We have made fifty hogsheads of sugar, and only used two chords of wood, without any coals. This I consider chiefly owing to Mr. Goring's new plan of placing a large boiler to be worked by the waste fire from the coppers,

with the steam from this boiler, and a little fire also under the small or old boiler (under which we use megass only), we are able to work the two pans twice a day with great ease and satisfaction.

6th.

Are the current expenses of the estate increased by the new system after the first outlay? If so, in what manner?

6th.

The current expenses of the estate are by no means increased after the first outlay; on the contrary, I feel confident that *an estate making five hundred hogsheads of sugar annually, would more than pay the expenses of the pans in one year by the saving of labour, increase of sugar, &c.*

7th.

Is your rum return affected in quantity or quality? If so, in what manner?

7th.

This question I am not prepared to answer satisfactorily. We are putting up the molasses for sale, and not using more than we can avoid in the distillery. We do not, however, get near so much molasses by the new process, but it is much thicker and very superior in quality, and, consequently, would not take so much to set up a given quantity of liquor for distillation; and my opinion is, that the rum would be improved in the same proportion as the quality of the molasses is improved.

8th.

Does your sugar cure well by drainage without artificial means?

8th.

I think the sugar cures well when boiled properly; but this question will be more properly answered by the accounts we receive from home, which I understand are favourable.

In making my answers to your questions, I think you may depend upon their correctness, and you are at liberty to make what use of them you please. Last week we made 23 hogsheads of sugar, or 42,000 lbs., from 37,300 gallons of raw cane juice; and used no fuel except megass.

P. S.—Since writing the above, I have ascertained from Mr. Chapman (Manager of the Main-stay), that they boiled 38,500 gallons of raw cane juice in the ordinary way, and made 36,800 lbs. of sugar during the last week; so that we made upwards of 5000lbs. of sugar more than they did, with 1200 gallons of liquor less, shewing, I think, a very great difference.

To Mr. Thomas Dodson. H. G.

Copy of a Letter from Mr. Bean to Mr. Dodson.

Dear Sir.—Having now had your vacuum-pans in operation for more than a twelvemonth on this estate, I have no hesitation in stating my opinion, grounded on the past year's experience, that they are of decided advantage, *and that the expense would be repaid, on an estate making an average of* 400 *hogsheads of sugar, in less than* 18 *months*. My mode of preparing the sugar from the pans has varied so much during the preceding year, that I cannot, without much trouble and considerable length, enter into details; but I hope this general declaration of my conviction that the vacuum-pans afford great advantages to those estates who use them, will answer your purpose. I shall always be happy to give any information to any person who may wish further information relating to them.

I am, dear Sir, your obedient servant,

To Mr. Dodson. Charles Bean.

DESCRIPTION OF MR. JESSOP'S IMPROVED RAILWAYS.

[Communicated by the Inventor.]

The usual course in the formation of railways, after the ground has been brought to the proper level, is to cover its surface with a bed of broken stone or gravel, of about one foot in thickness, as a foundation for the blocks of stone used to support the rails, and which are then placed upon this material. The rails are attached to these blocks by cast iron pedestals, or chairs, which latter are fixed to the blocks by iron pins, driven into holes previously drilled in the stone, and filled up by wood plugs, all being thus firmly united together. Adequate provision, however, has never been made for the change of position to which the blocks are subjected, from the sinking of the ground and other causes. " We find in practice," says Mr. Wood, in his very useful Treatise on Railroads, " that it is extremely difficult to form a surface upon which the stone is to rest, that is perfectly uniform in solidity, and which will not yield to the pressure when carriages come upon it, and thus allow the stone to sink on one side or other, and destroy its parallelism with the general line of road." (p. 27.)—" The shocks to the carriage-wheels, the obstructions to the moving power, and the injury to the carriages and rails themselves, thence arising, must be so very apparent as to need no illustration; and the necessity of remedying such a defect so very obvious, as to strike, in the most forcible manner, any one at all conversant with the subject." (p. 30.) In addition to the defects thus glanced at by Mr. Wood, the rubbing of the pedestal on the surface of the stone block, occasioned by the motion given to the rail by the load passing over it, has been found a considerable source of injury.

To obviate these various objections, Mr. Jessop, of the Butterley Iron Works, has invented the new mode of construction represented in the accompanying engravings, the advantages of which are:—

1st. Accuracy in the gauge of the railroad.

2d. The surface of the rails being kept in one straight line, and the proper bearing of the wheels ensured.

3d. The rails retained in the position of *their greatest strength*, by their depth *being perpendicular* to the pressure.

4th. The pedestals being made to bear firmly on the block, under any circumstances of irregular depression, and the pressure of the load being always perpendicular, thereby diminishing the tendency of the block to slide.

5th. No motion or attrition between the pedestal and the block.

6th. Facility of adjustment.

Fig. 1 represents a side view of a railway thus constructed; 2, the plan; 3, the cross section. Two of the stone blocks are drawn in an inclined position to show the action of the improved pedestal. Figs. 4 and 5 are sections of the pedestal and chair or seat for the rails, showing an orbicular joint by which the pedestal adapts itself to any irregular sinking of the stone blocks, whilst a connecting-bar retains the rails in their proper gauge, and their surfaces in the same plane. Figs. 6, 7, and 8, are other views of the pedestal and chair. Figs. 1, 2, and 3, are on a scale of half an inch to a foot; figs. 4, 5, 6, 7, and 8, on a scale of 2½ inches to a foot.

The gauge of the railroad, it will be seen, is permanently ensured by connecting together the two opposite chairs by means of an inflexible bar, which, at the same time, preserves the perpendicular position of the rails, and retains their surfaces in the same straight line.

The pedestal and chair, or seat of the rail, are made in distinct parts, and connected together by the intervention of the universal joint, which permits the pedestal to adapt itself to any position the stone block may acquire, like the ankle-joint to the foot, and secures a firm and solid bearing. The connecting-bar and joint prevent lateral pressure on the block, by which its great tendency to take an inclined position, or to slide, is removed. The blocks will still be subject to depression, where the ground has not become consolidated, but provision is made for preserving the level of the rail by the insertion of a packing of wood between the block and pedestal, equal in thickness to the sinking of the block, and without disturbing the solid bed the block has acquired.

The tendency to lateral motion in the block being by these means removed, where stone blocks are expensive from carriage, or difficult to be procured, cast iron bed-plates may be substituted, with

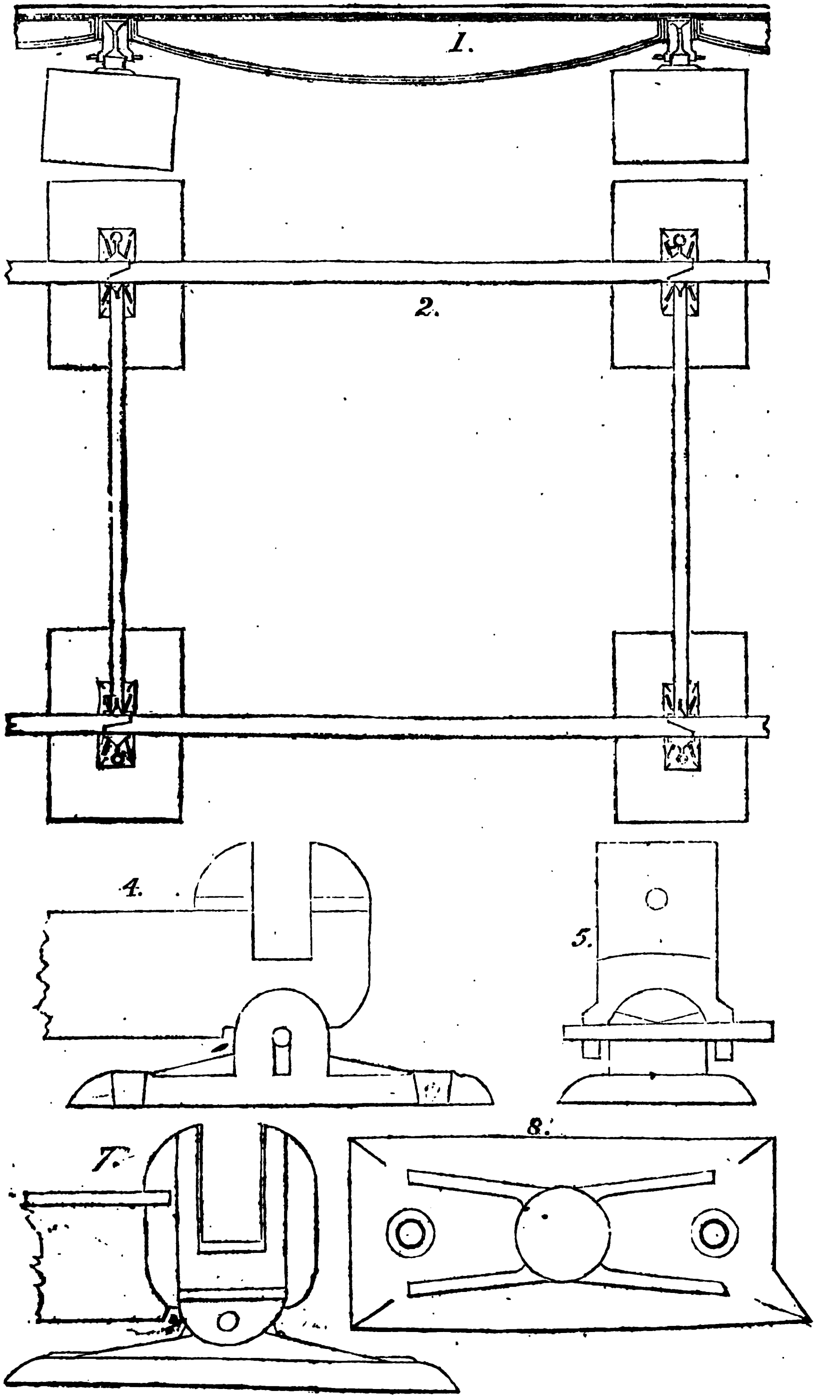

1.
2.
4.
5.
7.
8.

Fig. 3.

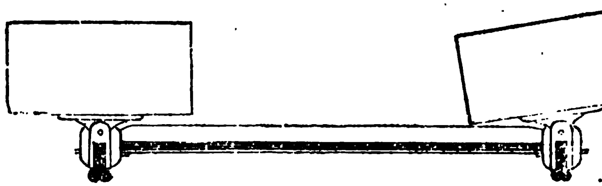
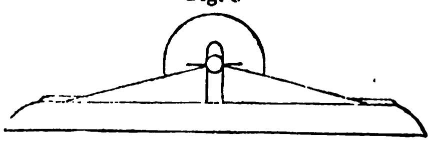


Fig. 6.



equal advantage to the railway, and with diminished cost.

The methods here explained apply equally to railways constructed of wrought iron or cast iron, and may be adapted to the tram-rail as well as to the edge-rail.

A diversity of opinion has existed as to the preference due to cast or wrought iron for rails. The latter material has been recommended, on account of its greater cohesion and less liability to sudden fracture, and yet the relative capability of the two to resist a given force, so long as their elasticity remains perfect, differs only as the numbers 178 and 153; but, whatever ground of preference these qualities afford, the system of using wrought iron rails in lengths of fifteen feet, supported as they are at intervals of three feet, necessarily affords a very imperfect structure, from the difficulty of obtaining a regular and uniform bearing, and from the undulation of surface caused by the deflexion of the iron, from the want of sufficient stiffness. In the progressive motion of a wheel on a railway, the load is transferred to a series of points in the rim of the wheel, as it revolves, which successively strike the surface of the rail, as they come in contact with it, with a force proportionate to the velocity with which the load is moving. The mechanical effect, therefore, of this contact is percussive or impulsive, and the struck surface will be affected as in the process of hammering. The elasticity of cast iron enables it to yield to the stroke with less alteration of form, all other circumstances being equal, than wrought iron, which, being more malleable and less *elastic, and, consequently*, less capable *of transmitting* the motion it receives through the whole mass, undergoes a change of structure at the part impressed; and an alteration of form not only follows, giving, from frequent repetition, a permanent set to the rail, but a partial *crippling* of the fibres of iron, *in the course of time*, seems inevitable. Cast iron appears, therefore, to be a better material to resist the wear to which railways are subject, and, when fixed on the improved principle, would not be liable to displacement from sudden fracture. From the advantage it affords, too, of being cast in lengths of six feet, or even nine feet, the sinking of a block would only cause a deviation in the level of the rail to the extent of the half, or one-third, as the case might be, of the irregularity the same sinking would occasion to supports placed at intervals of every three feet. Cast iron rails of nine feet long, suitably proportioned, and supported at the ends, would always lie firm and solid, and, with proper scarfed joinings, would form a more perfect railway than one with more frequent bearings. Besides which, the increased length would allow a fuller effect from the elastic properties of the material. "Long rails," as Mr. Tredgold says, "resist percussion better than short ones." (Railways, p. 128.) The labour in repairs and adjustment would also be diminished in proportion to the reduced number of supports. The additional weight of iron required, from the length of the rail, would be compensated by the above saving, and by the reduced number of blocks, pedestals, and connecting-bars; all which considerations, however, it must be allowed, are *secondary* to the attainment of the greatest perfection of which a railway is susceptible.

THE NEW SUBSTANCE THIOGEN.

,—I was highly gratified with the of Mr. J. M. Corbett, in the Num- f your useful Magazine for the 22d ne. Whilst struck by the import- hange which these experiments (if med) are likely to produce, both in heories and nomenclature of inor- chemistry, one application occurred which I think of some importance, I hope that Mr. Corbett (provided ink the suggestion of any value) endeavour to confirm it by experi- He mentions that thiogen pos- the property of decomposing phos- s, by depriving it of hydrogen; this iment, I think, may lead to an im- nt result, viz., to the decomposition metals. Every chemist is aware of ry close resemblance between phos- s and arsenic, not only in odour n the property of uniting with hy- n, but in the peculiar mode of com- on with oxygen, forming the arsenic hosphoric acids, whilst these acids elves form salts with bases which isposed to unite with the same ity of water of crystallisation, and to e the same crystalline form. This d the properties of arsenic and phos- acids to be early investigated by herlich, whilst making his re- es on isomorphism.

nsidering, therefore, the close ana- which exists between phosphorus rsenic in all their combinations, I it is extremely probable that arsenic also contain hydrogen, and if so, her metals may also be compounds. orbett does not state the mode in he employs thiogen to decompose orus; but as I feel convinced that c (provided the experiments rela- phosphorus are correct) must also ompound, I think it likely that, by pplication of heat to a mixture of n and metallic arsenic, the latter e decomposed. But as Mr. Corbett w, probably, ascertained more of operties of thiogen, he will, I have ubt, be able to devise more conveni- odes of manipulation.

conclusion, Sir, allow me to men- hat the sole reason for my occupy- our valuable columns at this mo- is, that I feel convinced that, as s the splendid experiments of Mr. tt become known, the continental *sts will apply them to every part of* chemistry; and as I have not at this moment the time to prosecute the inquiry, I have published my ideas, in order that their truth or fallacy may be investigated by the same able hand which has enriched science with facts, the discovery of which Davy only thought possible.

I am, Sir,
Your obedient humble servant,
T. RODGERS.

5, Burton-street, Burton-crescent,
London.

OF MALTING INDIAN CORN, AND A PRETTY CONSIDERABLE LOT OF THINGS BESIDES. BY DUTY D. DOUBIKINS.

[There is an idea very prevalent in this country that all Americans are merely calculators; and, it must be confessed, that the letter inserted in our Journal of the 22d of June, from "R. C., Brewer and Distiller, Utica, N. Y.," in which he offered to furnish the English public with any information respecting the malting of Indian corn which might be "*deemed worth paying for*," was but too well calculated to confirm the impression. We have great pleasure, therefore, in inserting the following letter on the subject from another American (though awful lengthy, we calculate); for though it does show profit-making notions to be uppermost in the writer's mind, it exhibits underneath much genuine kindliness and liberality of feeling.—ED. M. M.]

Mr. Editor,—I say Mister, you see, I guess, I've jist come over, about three months, to the old country, with a sorted cargo of all sorts o' things—cracker-biscuits, Newtown pippins, flour, lots o' bees' wax, made English by shipping to Canada to get over the duties, which are tarnal high on Yankee produce, and lots o' salt-fish,—they all came along with me, for I'm supercargo—cheap way that of getting a passage—in Uncle Peabody's brig—such a craft, you never see'd her like, I tell ye—goes right through the water in a straight line, instead o' dancing up and down and making double distance. How she slicked it off—streaked it like a flash o' lightning,—never see'd a plank of her deck the whole way for the water on it; never had shoe or stocking on, to say nothing of aour traowses with stockings to them all in the piece, such as Captain Obadiah Congar wears in the musquito season: and the cargo as dry—as Deacon Tibbets when he calls for the cyder after talking for two hours about the wickedness o' Sunday travelling (did'nt anchor the brig on a Sunday, for all that). Captain Obadiah winked at me, and asked if Deacon Tibbetts could run as fast as the brig, to take her up for Sunday travel-

king. I laughed a horse-laugh right in his face, I tell ye. But, as I was saying, not a cracker got mouldy on the trip. How that critter of a brig did slick it off. No signs of the sea sarpent; but Captain Obadiah Congar said the sea sarpent could have no chance with the brig at running. Well, here I am, and why I came was to trade away the cargo, and buy in a stock of wild beasts for a return. Special awful speculation that. It's all between Uncle Peabody and myself. They are all for a travelling shew. Aour people are mighty sharp upon looking after strange varments, only they can't let the elephants alone. They must be rifling the critters at long shots, and it cannot be denied that it is a special tempting thing, because the hunters never meet such varments in the woods. I say, Mister, don't you think now a rifle would partly go off in its own accord, if it was to fall in with one of those mammoths or behemoths walking along, all alive, in the woods, and picking up butter-nuts? Well, there was one elephant, called Little Bet, and not so little neither, for I do believe her forefoot might have covered up Aunt Kezias' great bible—what sort o' a critter would a Big Bet be? Well, Little Bet was crossing a bridge, which was none of the firmest, for the timbers were not of honey locust, and the planks were rather scattery, the neighbours having borrowed some to mend a barn close by, and put some rails from the snake fence, jist to step upon. Well, Little Bet was covered up in canvass, like a walking tent, all but her head, jist to tease the people who looked, and make them want to see her tail after, so as to bring in the quarter dollars. She was a considerable huge varment, and more like a balloon than a live critter. Well, jist out of an old mill close by, a tarnal fellow pops the muzzle of a rifle, and, before you could say Hezekiah help us, drives a ragged bullet, 100 to the paound, as slick as grease in at the crack of her skull, between brain and bone, and down she falls as dead as Romulus. An all-powerful critter she was, could draw more nor a flax-seed poultice! But wasn't it cleverly done, Mister? I'm told that your people had to kill a mad elephant called Choony, and it took 'em three days, with musquets and rifles, and *swords, and spears*, and baggonets, and *all sorts of weepons*, and at last they finished him with a four-pounder cannon-gun, as big as a log o' maple, which took a whole horn o' paouder to load him. They said, in aour country, that 150lbs. of lead was dug out of the critter after he gave his death-screetch. But all that's nothing to what I want to say. You see I'm somebody in aour country. I guess I've got a considerable farm, forty miles up the North River, which your people call the Hudson; and I've got one of your people, from Battle, in Sussex, called Edward, and he cultivates it in shares,—I find land and he finds work. How I and my old woman laughed when we first saw him. I found him wandering in the streets of York with his mouth open, and such a pair of heavy shoes, and corduroy* breeches, like our logroads of round trees, and worsted stockings, in a hot day that you might broil a canvass back duck on the back of your hand in the sun, and a sort of coat on like our hunting frocks. All his things are in the Museum now; and how some of the back country people do laugh when they see the shoes, and swear they'd rather go barefoot, and carry two rifles of fifty, than wear them. Well, says I to him, do you want work? He made some answer which meant yes, but what the words were I could no how comprehend, because, you see, your people in the old country can't speak English, not being larnt when they're little. Well, then, Edward is mister, working on my farm, and my old woman begins partly to understand the critter's talk, and if you like to go and see him you'll be awful welcome, I tell ye. I shan't tax ye more than a dollar and quarter per week for your board, and daughter Becky keeps the house awful clean, though we an't got much help for that part; and you'll have for breakfast boiled pork, and roast pork, and molasses that'll stick your ribs together, and tea and coffee, and oceans of milk—Becky always 'livers the milk herself, because we are short of help—and bread and butter, better nor the best Goshen,—our dog Watch always churns the butter in the cellar, a real cool one I tell ye; but that Watch he's a cruel cute critter, he does'nt like churning; and a prime churn it is, all my own invention, and something like your treadmills, only

* From cœur du roi, hard hearted. Your corduroy is a terrible bone-shaker.

the wheel's a 'clined plane instead; you shall see it, Mister, when you come. It saves a power of help. But that Watch—when Becky wants him, the critter knows there's butter to make, and it's high fun to see how Jerusalem-lightning-like he shies through the ten acre lot, and stows himself away in the wood, and Becky arter him, and I laughing fit to split, and the old woman scolding. But, besides all this for breakfast, you shall have mush, and hominy, and carn-cakes, and buck-wheat cakes,—oh! you shall have a ream of 'em, if you like, dripping in Becky's butter, and drowned in molasses. And then at dinner, Mister, you shall have lots o' every thing but butcher's meat, because, you see, we're not handy like for that last: and then at tea, we don't eat no meat particular, except pork, and hung beef, and dried fish; but then my old woman has a power o' sweetmeats and a regiment of cakes; they cover all the table. There's long cakes and short cakes, and round cakes, and square cakes, and butter cakes, and sugar cakes, and molasses cakes, and I do'nt know how many more cakes besides. And then you may have as much whiskey as you like. But I say, Mister, you must'nt be proud because Edward sits down to table with us—you dont do that in the old country; but as I said to my old woman, though the critter doesn't talk good English, he's a fellow-critter still, and it war'nt his fault that he war'nt larnt when he was little. And talking o that, he's saved a power o' dollars already, and I've brought them over here to pay the passage of his wife and an instalment o' children, out o' fourteen that he left in the workhouse. He wanted the parish to send them out, but they knew better, for they had found out some how that working men was better off in our country than many masters in England; but I drove a prime trade with them I tell ye. I made 'em believe that Edward had broken his leg, and could'nt arn no more dollars, so they agreed to pay half the passage, and the whole boilin are to go back with me in Uncle Peabody's brig, so we shall get some o' the profit out o' the speculation. How the young uns 'ill swim in the lee scuppers when the brig takes it in forward, won't they Mister? Mustn't get any of them drowned though, for Edward is very fond of 'em, as is partly natural. Well, but Mister, you see I've got four sons besides Becky. There's my firstborn, Jedediah, he's provided for—he's got a good place as a guard at the state prison—he's a real slick 'un at managing the malefactors, and when its his watch, wont close an eye all night. Then there's Jonathan, my second born, he commands the sloop, and we call him Captain. He's a real good un, and so is the sloop for that matter. I built her myself, with only one helper, in the winter. The timber was all cut on my farm. She'll carry a power of stone from the quarry. Only see how slick she'll go through Hell gates. I and the Captain often quarrel about her sailing trim; he's considerable some abstinacious; that's all very well with other people who want to take him in—no fear o' that though; but its onproper to his father. I'm a special pilot for the East River, I tell ye; I larnt when I kept tavern on Long Island. Well, then there's my third, Tribulation; he's got an awful fine show I calculate, with the ruins of Persepolis and Babylon, and the Senate House, and the House of Representatives, and painted wild beasts. He's got an all-powerful critter of a mare too, to draw the cart with the show box; and he makes lots o' quarter dallars I tell ye, and travels to all parts o' the Union. Well Mister, then there's my fourth-born, Bennie—he's now growing up, and the critter's awful slick at mischief—none the worse for that though. Last year he girdled a sycamore that Becky planted in the garden when she was no higher than a nutmeg, because he said it impeded his view of the sloop at anchor; and the cute critter girdled the tree underground, and Becky watered and watered, and somebody advised skim-milk, but it was all o' no manner o' use, because the tree couldent suck; and then when the tree was grubbed up, it was found out. How mad Becky was, but Bennie is his mother's favourite. She always takes him to the shouting match with her, which she calls chapel—she is a queer old woman; she will go every Sunday to Tarry Town, which is fourteen miles, to hear a special preacher, when our preacher can shout loudest by one half; and she won't go by the steam boat, because she's afraid o' the big kettles boiling over, and so she has the span of horses put into the waggon: it's a prime light waggon, I built it myself, timber cut on the farm, and it's

suspended on chains, as easy as a rocking chair; and Bennie drives the span, and a slick hand he is at it I tell ye, but rather ventersome. And so he upset the waggon atop o' the old woman once, but he didn't break no bones, and I didn't care, for the old woman was afraid to go for three Sundays, and wanted me to drive her, but I woudent, for you see Mister, a little o' that ere shouting goes a great way with me. Well, as I was saying, I want to set Bennie up in the world, and so Uncle Peabody and I entered into this almighty clever speculation of the wild beasts, and Bennie's to travel about with them. That's what I came over to the old country about, and perhaps I'll take a wife back for him, if I can meet with a likely one, for these gals of the old country are devils at working, which is more than all our Yankee gals are. So as I've sold all my flour and things, I thought I'd see the sights; and first of all I asked about the museums: I'm fond of museums—I once kept one in Broadway, and made a power o' quarter dallars. And so the people told me you kept a "Museum;" and I inquired, and how I did but laugh right out when I found that your museum was a printed book—what queer ways they have in the old country. Well, Mister, I guess I found lots o' schemes and pictures in it; so I desire, when I go back to aour country, that you send it me regular, as it may help me to make improvements on the farm. And now I come to the pith o' what I wanted to write about, so you mustn't expect a long letter. There's one of aour people, a real Yankee I take it, a genuine cyder-waterer, one R(ehoboam) C(alculation) Brewer and Distiller of Utica, N. Y., has writ a letter to you in No. 515, page 183, of your "Museum," about malting *carn*—what you call maise, you see Mister, but we always call it carn. Edward knows how to plant, and harrow, and horse-hoe it already. I don't like Rehoboam, Mister, for he wants to trade away the reputation of aour country. He gets admitted to your "Museum," and then wants to sell what he knows. I say, why did'nt you charge him for an advertisement? Rehoboam says carn can't be malted only jist after its harvested. Now, Mister, I'll put you up how to trick the critter, because he wants to drive a paltry *trade; if it was a good trade one wouldn't mind it; but to sell* his country's good name in a public museum for a few dallars, I can't abide it no how. So jist ask him, Mister, if they plant all the next year's carn jist "after harvesting," and if it won't sprout with planting next year, though it be as hard as a piece of the nether milstone. I se'ed some carn cobs this very day, Mister, hanging in the windows of a great store, jist like that of Grant Thorburn, at New York, and I see'd a boy go in and bring two cents worth, and he said it was for planting, and it looked as hard and yellow as a bit o' bird's eye maple. Now, Mister, I take it that Rehoboam means by "germinating" what we call sprouting. Now if the carn sprouts in the arth, why shouldn't it be done so out of the arth, and then kiln-dried and malted. It's partly my belief, Mister, that *carn* won't steep like barley under water, because it wants more air; but if it was laid thin on tiles, and covered with damp sand, it would sprout awful beautiful; and so you may tell Mister J. D., with my respects, and tell him not to give Rehoboam nothing. I say, Mister, I guess Rehoboam wants to persuade you Cockneys that carn is for all the world like the wooden water-melon seeds, carved out o' lime tree, that he used to sell in the West, before he settled down in Utica. The squatters might watch them a long time before they sprouted, I say, Mister. They'd rot in the arth fast enough. I'm in a hurry, and Captain Obadiah Congar is waiting to take me to a dinner of pork and greens, otherwise I'd perhaps have written you a long letter, but you must be content for the present with this hint. A word to the wise is enough.

Your's in haste,
DUTY D. DOUBIKINS,
York State.

P. S. I say, Mister, do come and see me—the old woman will take you in the waggon with the span of horses to hear the shouting, and I shan't tax you more than a dallar a week for your board. You can have a passage in the brig, and Captain Obadiah Congar says he'll make you awful comfortable; lots o' mush and molasses for breakfast—jist come and dine with us on board. There's a large brass rail all round the cabin, to hold on by in a gale. The brig's jist like a live critter.

London Docks.

I say, Mister, I forgot, I guess, to tell

you what a sublimity of a place my farm is—you never seed any thing more beautiful in the old country I tell ye. The house is located on a bit of a hillock, with sich an awful pleasant prospect. It's built o' clap-boards over timber work. I partly built it myself. All the timber was cut on the farm, and it's a real good shingled roof I tell ye, and all painted three times in white lead and oil. I bought the first keg I used of a Yankee, and the tarnal critter shaved me, for 'twere only chalk. Guess he won't shave me again. Well, the house looks considerable white at a distance, I tell ye, but close on its rather honey-comby, with the tarnal hornets—they'll bore ye a hole as round as a centre bit. Well, and I've got considerable of a garden round the house, and its well fenced, and the fence is overgrown with climbers, and quite a wood o' peach trees; considerable beautiful they look I tell ye, when the blossom and the first green leaves are on. And there's a draw well, and flowers, and water-melons, and pumpkins, in season. I say, Mister, do you like pumpkin pie? That's real good, I tell ye. And then I've got some cherry trees, prime bearers. Lots o' gals come up to eat 'em in season. Glorious time that, only my old woman's rather jealous. And then you can sit in the porch on a summer morning or evening: there's a boarded floor to the porch, and jist in front there's a sloping grassy bank, and flowers in patches, and roses, and beautiful shrubs, and in the corner the place where Bennie girdled the tree. And then you look over the fence on the left, and you see the woods on the uplands, with their waving tops following the line of the hills and valleys; and below there's a flat patch o' land, rich enough to grow carn as tall as fir trees, and there's a brook ripples through it, and the slopes rise upward from it, with grass up to your middle, and the quadruped critters in it; and Edward sometimes stops his plough to look round, and if he catches me within hail, he says,—"Oh! measter, I be main glad I comed here;" and then I says to him, says I, ye darned tarnal critter, I tell ye we arnt got no masters here, we're all alike citizens. My old woman ca'nt abide to hear him say master neither, and Bennie laughs right out at him. Well, and then to the right there's a far view over the hills towards Tarry Town and York; and there's a part of the village too jist shews itself, with white houses and green gardens, and orchards, and there's the old chapel and the new chapel; and then there's the North River, with the sloops in it and the steamers, and when there's no wind it looks like a looking-glass. And then the wooded heights on the other side, and then the thousand beauties of all sorts. Oh! Mister, if you were to sit in my porch, you'd be ready to cry jist with the joy of a full heart, amongst so much beauty, as I have often done, and as they say Daniel Boon did when he first rubbed his eyes jist as old Kentucky first opened on them, when he discovered it. Do come and see it all, Mister. I guess I won't tax you nothing at all for your board, and you may stop as long as you like, and you shall know all the neighbours. I'll take you round with the waggon and the span of horses; and you shall go to the tavern and hear them talk politics. All the neighbours are good uns except 'Squire George, and he's rather proud, because he's a big man with a power o' dallars—he can't abide me, because I'm too 'cute for him. You'll take your passage in Uncle Peabody's brig: we may as well have a profit out of you as ane other; but you shall have a passage free gratis for nothing, rather than not go. You can tell me of many improvements for the farm, and that will make it up.

The Practice of Isometrical Perspective. By Joseph Jopling, Architect. To be completed in Four Parts. Price 1*s.* each.*

It is with great pleasure we announce the publication of this useful and interesting little work, the first part of which is now before us. The architectural student and the general draughtsman, as well as the aspiring mechanic, not already acquainted with the details and varied application of the subject on which the publication treats, will derive such information from its pages as they could obtain from no work evio u sly published.

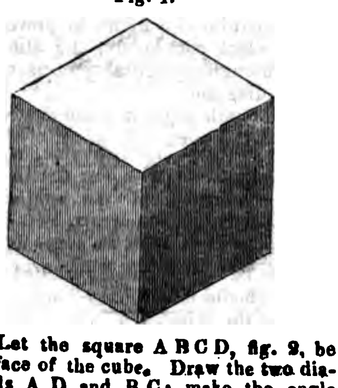
* The present review is from the pen of our valuable correspondent "R," who, to his other qualifications for the task, adds that of having had more practice in drawing objects in isometrical perspective than perhaps any other living artist—not even excepting our ingenious friend the author of the treatise himself.—Ed. M. M.

It can scarcely be necessary here to point out the utility of the study of perspective to draughtsmen. If not the foundation of the pictorial art, it is a species of knowledge so essential to its cultivation, that no one can advance, without it, much beyond the first rude essays of uncivilised life. It is not merely a help or guide to the artist's pencil, but the actual key which throws open to him the whole realms of space, bringing the distant equally with the near, within his power, and making each an essential help to the just delineation of the other. And although isometrical projection is an *unnatural* perspective, because the various proportionate dimensions of objects can never be seen from any one point as they exist in nature, yet the advantages of this kind of projection in delineating objects (especially those that we are accustomed to view below the level of the eye,) will at once be apparent to the student on his perusing the pamphlet before us.

Mr. Jopling commences his work by defining what a *cube* is; and after giving its usual definition, namely, "a solid figure, bounded by six equal square sides or faces," he proceeds to illustrate this by numerous other definitions. The manner of projecting a cube then follows; and the instructions for this purpose, which are exceedingly clear and comprehensive, we shall give in the author's own words:—

"*To draw the Representation of a Cube, as in fig.* 1.

Fig. 1.



"Let the square A B C D, fig. 2, be one face of the cube. Draw the two diagonals A D and B C; make the angle *e* B C equal to 30°. Then take *e* B as a radius, and with it describe the circle, fig. 3. With the same radius divide the

Fig. 2.

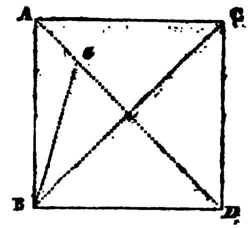
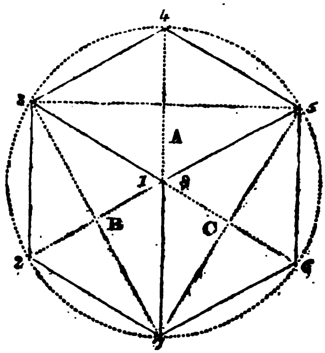


Fig. 3.



circumference of the circle into six equal part, and draw the three radii from the the point 1, to the points 3, 5, and 7, and the hexagon to the several points 2, 3, 4, 5, 6, and 7.

"For general purposes, instead of finding the directions of these lines, by dividing a circle in this way, a triangle, having angles of 30°, 60°, and 90°, with a parallel ruler, are recommended to be used.

"If the parallel ruler be perpendicular to the radius 1, 7, the longest leg of the triangle being placed against the edge of the ruler, and also inverted,—by the other leg and the hypothenuse all the other lines may be drawn, as will evidently ap-appear, by applying a ruler and a triangle to the diagram.*

"* At the repeated suggestion of different professional gentlemen, the author has explained to Mr. Elliott, of No. 227, High Holborn, what models, moulds, and instruments are desirable to give the best idea of the subject, and also those which may be said to be essential for conveniently drawing objects in this perspective. The latter Mr. Elliott has undertaken to have ready for sale, and he will manufacture them, or any other, in any materials which may be desired. Mr. Elliott has, as a manufacturer of mathematical instruments, given such general satisfaction to professional gentlemen, that the author feels himself fully warranted in recommending him on the present occasion."

"If fig. 2 be the exact size of the face of any cube, then figs. 1 and 3 will, at a moderate distance, appear to be correct representations of a cube of that magnitude, of which they are exact projections. If each face of the cube be 100 feet square, then will A B, fig. 2, be a scale of 100 feet, by which the length of any line, or the distance between any points on, or within, the cube, may be ascertained; and by it, the plans, elevations, and sections of any object may be drawn. By the same scale also, the major diagonals 3-5, 5·7, or 7-3, on the three faces of the representation of the cube in fig. 3, or any lines on each face parallel to those diagonals, may be measured.

"From the several divisions, supposed to be on the scale A B, if lines be drawn parallel to A D, the line *a* B will be divi ed in the same proportion, and form a scale of 100 feet, by which the length of any lines on each face in fig. 3, parallel to the radii or sides of the hexagon, may be measured, and by it, and in those directions, the dimensions of any rectilinear and rectangular object may be set off, and representative lines drawn, or the distances by which the position of any point, or the direction of any oblique line or plane, may be determined. By means of the proportional compasses, which may have the adjustment marked upon them, the proportion of *a* B : A B, and of course the isometrical measure of any line on any plan, elevation, or section of any object intended to be represented, may be obtained."—p. 2.

It may be worth noticing more particularly, that there is no other instrument required for drawing isometrical perspective, in addition to the usual drawing instruments, but a small piece of mahogany called a *set* (from being placed or *set* on the square), of the same thickness as the square used, and of the form of the following figure:—

Fig. *.

For small drawings the size may be eight inches. This piece of wood will be found useful in every sort of architectural drawing, as it may always be placed at right angles to the drawing square, and while the horizontal lines are produced by one, the perpendicular lines can be drawn by the other; by which means the necessity of turning the square is superseded. But to its use in isometrical drawing. When the back *b*, of the set square just represented, is laid against the drawing square, a line drawn along the edge of *a*, makes an angle of 30° with *b*; when *c* is placed against the drawing square, a line drawn along *a* makes an angle of 60° with *c*; and, in the same position, a line drawn along *b* makes an angle of 90° with *c*. This then is the triangle recommended to be used, and when placed in its present position it will be perceived that the lines of the cube (fig. 3 Mr. Jopling's work), 7, 2, or 1, 3, may be drawn. The corner of the set is cut off merely to prevent it breaking, as the grain of the wood is supposed to run in that direction.

In the fourth page the author has given a very useful diagram, to which we refer the reader, as the substance of it is nearly comprehended in the diagrams already quoted. The intention of this diagram is to shew how, and why, the heights and lengths of an object are reduced by being viewed at a certain angle; and also to shew that the projection of the side and the diagonal of a square are, at this particular angle at which it is viewed, of the same length. On a thorough knowledge of this diagram, and the two immediately preceding ones, wholly depend the advantage to be derived by a student from the perusal of the work. The author next gives directions how to cut a card to this figure to prove it with that which goes before, and also how to go through a practical process to prove both diagrams.

The sixth page, in connexion with the preceding ones, will be read with pleasure by those who are ingenious in modelling, and also by lovers of mathematical shadowing. The fifth line from the top in page 7 is not very clear; perhaps the comma after "horizontal" had better be omitted, or if retained the passage should read thus:—"and *to be* the top of the object."

The author proceeds to explain the different ways in which a cube represented in isometrical perspective may be viewed, and how the meeting of the

lines in the centre may be seen alternately as an external or internal angle. We remember being forcibly struck with this sudden transition one day in the show-room of Mr. Cubitt, of Gray's-inn-lane. A table stood on the middle of the floor, which was inlaid with pieces of marble, and the different colours, and the manner in which they were placed, formed shaded cubes in isometrical perspective. The transition from external to internal angles was alternately produced by shutting one eye and opening the other, and the reverse; and the change of the top of the cube becoming the sides, &c., was effected by changing our position in the room.

The author gives a list of some of the objects that he considers may be represented with advantage in isometrical perspective. We must differ with him, however, as to its appropriateness for "cities." It is not without some difficulty that we are reconciled to its unnatural appearance in the extent of a homestead, and we should like it much less in the representation of a multitudinous mass of buildings. Indeed, as we have already said, the actual proportional size of objects in relation to each other, as they really exist, can never be seen by an observer. Hence the beauty of regular perspective:—

"Taught by rule, each figure finds its place,
And miles seem measured in an inch of space."

Had the artist who took a view of London from the top of St. Paul's, done it in isometrical perspective, we should have been astounded to see Westminster Abbey as large as if we were close to it. We suppose Raphael had isometrical perspective in view when he painted our Saviour's transfiguration on the mount, where the figures in the foreground and those on the top of the mount are nearly the same size, and where the female on her knees is nearly half as high as the mount itself; also in the *cartoon* representing the miraculous draught of fishes where the features of all the men in the boats, a good way out, are as plain as the eyes and beaks of the fowls in the foreground, &c. No: to represent cities in isometrical perspective would destroy the mellow tint of the distance, and banish aerial perspective, so beautifully exhibited in the landscapes of Claude. *The truth is, that no* objects that we are *accustomed to see above* the eye appear natural in this perspective; it is best adapted for furniture and machinery, though many of the other objects which Mr. Jopling has named may, by this mode, be represented with advantage.

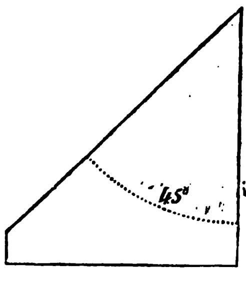
This first part of the work concludes by giving examples of representing "plain, rectilinear, and rectangular objects;" but we could have wished that the author had gone through the process of representing them, notwithstanding the previous explanatory diagrams.

The work, taken as a whole, will form a valuable and cheap manual, and we could wish it to be in the hands of every professional draughtsman who may desire to have a knowledge of so valuable a kind of projection. We say, "professional draughtsman," because, from the many technicalities necessarily introduced, it is better calculated for them than for the plain working mechanic. The former has, or ought to have, a knowledge of geometry and geometrical terms.

We shall now subjoin the shortest method of drawing in isometrical perspective, for the use of those who have only *heard* of such a book as *Euclid's Elements*. It is founded on much the same principles as the work before us, but it is the shortest way of going about the business, and in the explanations we shall carefully avoid all but indispensable technicalities. In the first place, the non-geometrician must understand the nature of *degrees*. This he may easily do, by dividing the fourth part of the circumference of a circle into 90 parts, and by drawing two lines from the centre to the circumference, including thirty of those parts, then he has between those two lines an angle of 30°. This angle he is already provided with by the small piece of wood, fig. *. He must now have another piece of wood, called an angle of 45° (fig. †), and this is all that is required. Let us now proceed to work.

Let fig. †† represent the plan of a small farm-yard, and, for the student's first attempt, we will suppose it to have a flat roof. Place the *set* fig. * on your square and draw the line *a, b*; reverse the set, and draw the lines which are at right angles to this line from the different points: then mark off the distances with your pencil on the edge of a slip of paper,

Fig. †.



and transfer them to the horizontal line *c*, *d*, fig. ‡, then draw up the perpendicular lines with the back of your set, and you then have the lengths so far. Place your set, fig. *, with the back *b* to the square, and from the point *e* produce the diverging lines, on the bottom lines of the building, right and left. Then for the height of the nearest walls: the scale by which your plan is drawn, fig. ¶, *h*, *f*, must now be reduced to measure the heights of the elevation; then, with your angle of 30°, from the point *f*, produce the line to *g*; then place your set up on end, that is, with the edge *c* to the square, and draw all the short lines from the several divisions, which will be square to the last line: here you have a reduced scale, from *f* to *g*, for measuring the heights of the elevation; and from *f* to *h* is, as before, the scale for the plan. We say " heights of the elevation," because all the lengths are found by projecting them on the plan, as in the first instance. The next thing to be done is, set up the height of the wall from your scale on the perpendicular line *e*, and then with your set draw the top of the wall right and left, which will, of course, be parallel to the bottom or ground line of the building. We have thus the nearest walls set up: now for the walls that front us inside of the court. Produce the lines of those walls, on the plan, to the points *i* and *k*, and from those points draw, with your angle of 45° set, the lines to *l* and *m*. Set up those distances on the line *c*, *d*, as before; and the distances from *e* to *l*, and from *e* to *m*, on the elevation, will, of course, be the same as between the corresponding letters on the plan: then draw up the line *m* to the point *n*, and from that point you will, with your angle, produce the ground line *o*; do the same with *l*, and you have the ground line of the other wall. The height of those two last walls may be found by taking the dimensions at *e*; but the proper way to find it is this: continue up the line *l* to *p*, and with your angle draw the line across, and do the same at *n*; the top of the walls, *q* and *r*, (on the plan) are found in the same way as have been described for *i* and *k*. Here we have the farm-yard in isometrical perspective; the drawing being found as directed for the other lines. We shall say no more, however, at present, lest we should confuse the operation. We are certain that if any one of ordinary capacity will but make the attempt to draw these figures, he will be sure to succeed; indeed, the operator will be surprised to find that the lines almost of themselves fall into their places; and if he, by repeated trials, can fully understand the three foregoing diagrams, a little reflexion will make him quite master of isometrical perspective.

But, to return to the Treatise before us. After explaining the different appearances that the representation of a cube may have, the author remarks—" This explanation of the several appearances which the same representation of a cube may have, will, perhaps, prevent that confusion which some have experienced when viewing an object in isometrical perspective. It is, indeed, hoped it will teach the observer how to view any object in this perspective as it is intended it should appear." It may be a bold thing to venture an alteration on a system established by such men as Professor Farish, &c.; and, indeed, we are aware that any change in this system will not at first be favourably received, because a long habit of considering a thing perfect gives it the superficial appearance of being superior to any change that may subsequently be attempted, and a powerful defence of established custom is sure to be made. Nevertheless, we would say that that confusion, which Mr. Jopling's explanation " of the several appearances which the same representation of a cube may have," is intended to guard against, may be much obviated, and a more natural perspective produced, by discarding the circle, the hexagon, and even the cube (!) and having the lines, instead of an angle of 30°, diverging at an angle of 25°, or even 22½ de-

Fig. ‡.

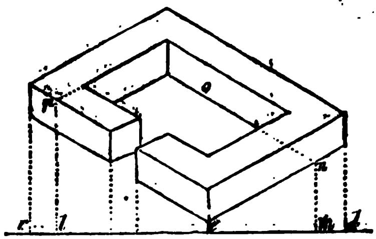


Fig. ††.

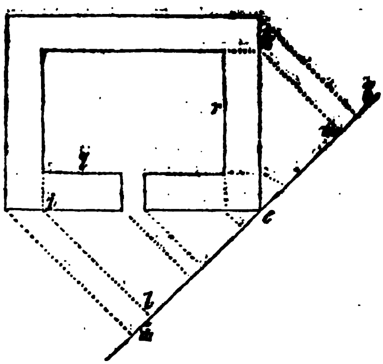
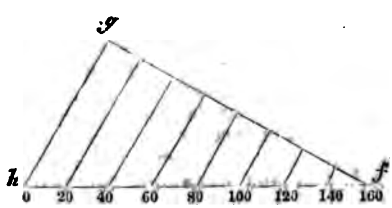
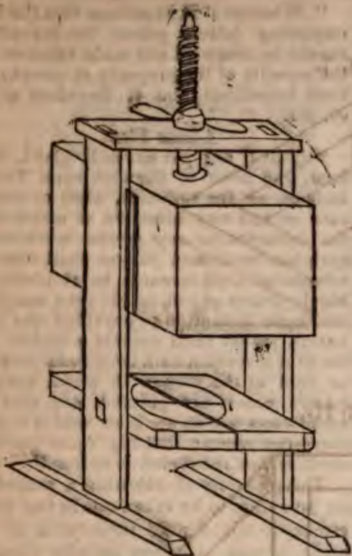


Fig ¶.



grees. This makes a much more natural perspective, and we have found, by repeated trials of the same objects, that there was no comparison in point of appearance. This might be done, and still preserve a principle similar to the theory and practice of the cube.

There are other sorts of perspective nearly allied to this, which is to isometrical perspective what parallel perspective is to angular bird's-eye view perspective. An object may be represented upon principle in the manner shewn by the following figure, without the lines radiating to a



point, as is the case in regular perspective. This mode of representation is well calculated for cabinet-makers and upholsterers. If Mr. Jopling does not consider this, and other kinds closely connected with it, as coming within the scope of isometrical perspective, in any of his forthcoming numbers, we shall, probably, at some future time, lay down rules for it in this Magazine, for the benefit of reading mechanics.

Again, notwithstanding what we have said, we congratulate all those who, from pleasure or necessity, use the square and compass, on the appearance of this work; because it is divested of those torturing problems generally found in books of this description, where the lines cross and recross each other in such various ways, that to an uninitiated person they resemble net-work or cobwebs more than explanations. The book is also useful, cheap, and interesting;—useful no one will doubt; cheap, because no draughtsman should put twenty times 4*s.* (the cost of the four parts) in the balance with a knowledge of this perspective; and interesting, as we have no other work entirely on the same subject.

R.

FIRE-ESCAPES.

Sir—The letter of C. W., at page 270 in your last number, recalls to mind an improvement which I suggested about four years since, in the boat-hook used by firemen, and by them called a *preventer.*

As at present constructed, they are very useful for a variety of purposes, and they form part of the equipment, when complete, of most good fire engines. Their value might, however, be very greatly increased, by having a strong female screw-ferule at the bottom, and carrying in addition a pole of similar dimensions, furnished with a male-screw to fit, the other end having a female screw, like the first. This would enable the *length* of the preventer to be increased *ad infinitum,* either to be used as a fire-escape, or for any other purpose.

Upon the end of the additional poles, axes, hammers, saws, and a variety of other useful tools might be very readily and conveniently affixed, which would prove of considerable utility, and very frequently tend much to facilitate the operations of the fireman.

I remain, Sir,

Yours respectfully,

W. Baddeley.

THE BILL FOR AMENDING THE PATENT LAWS.

We proceed now to fulfil the promise we made in our last Number, to "prove in detail" that the Bill "to amend" the patent laws, which has just passed the House of Commons, and is now reposing in the House of Lords, is all that we have represented it to be; that is to say, a Bill calculated to unsettle and perplex, in no ordinary degree, those laws which it *professes to* "amend,"—to injure *greatly the parties whose* property it *pretends "to secure,"*—and, finally, to throw open the whole arts and manufactures of the country to a most ruinous system of monopoly. We gather from several letters we have received during the week (some of them from parties who stand as high as any in our esteem), that our condemnation of the measure is considered too sweeping and severe to be possibly true. But to the writers of these letters, and to all others similarly impressed, we say—do but attend to what we have to adduce in sup

port of our opinion, before you thus set us down as idle railers. If we do not make good every thing we have advanced on the subject—aye to the very letter—then may we never have credit with our readers more. We have been blamed for speaking in terms of "personal disrespect" of the author of the Bill, "and his coadjutors." It is proper, therefore, we should state that we know nothing of Mr. Godson personally, and have no certain knowledge as to who his coadjutors were, (we mean the *active* coadjutors or *prompters* behind the curtain, for of the select committee appointed on Mr. Godson's nomination we make no account,) and that all we have said of either the one or the other has been entirely founded on an examination of the Bill itself, in the different shapes which it has assumed since the time of its first introduction. If we censured Mr. Godson for having "undertaken a task for which he is unequal," it was partly because of the extraordinary ignorance shewn throughout the Bill of those important principles of public policy which are interwoven with the law of patents, and a knowledge of which is essential to a right understanding of their operation; and partly because of the loose, slovenly, informal, and inaccurate manner in which the Bill was worded, and which, in any view of the matter, was most discreditable. If we farther pronounced the spirit in which the Bill was conceived to be so bad, as to forbid our entertaining any hope of its ever "being moulded into a shape fit for the adoption of the legislature," we did so on this ground, that the paramount object of the framers of the Bill—the only object never lost sight of amid all their mistakes and blunders—was to nullify patents, without any regard whatever to their utility, to the grievous injury both of the public and of all deserving inventors. All these points we hope to make quite clear before we have done; and when we shall have done so, we think we need be under no uneasiness as to the judgment which the public may form of the course we have pursued in this matter.

Now, then, to our task. We shall give, *seriatim*, the clauses of the Bill as it has passed the Commons, and subjoin our remarks upon each, numbering the clauses as we proceed, for the sake of easier reference.

General Preamble.

"Whereas it is expedient that the laws respecting letters patent for inventions should be amended and made effectual for the security of the property of inventors in their inventions; be it therefore enacted, &c.

Clause First.

"That if any person in England, Scotland, the town of Berwick upon Tweed, Ireland, or the Colonies, shall communicate or sell any invention of which he is the inventor to any person whatsoever, such last-mentioned person shall with the consent of such inventor be at liberty to obtain letters patent in his own name for the same invention; provided the said letters patent shall contain a recital that the said invention hath been communicated or sold to the person to whom the said letters patent are granted; and that the said letters patent shall be void if it shall thereafter appear that any fraud has been used, or that the recital is untrue."

The propriety of allowing a patent for an invention to be taken out in the name either of the original inventor or of any other person to whom he may *formally* assign it *for the purpose of taking out a patent*, nobody will probably dispute; but this clause, it will be observed, goes a great way farther. "*Communicate or sell*" are the words. Now, a person may communicate an invention to another without meaning that that other person should take out a patent for it; and yet a patent taken out under such circumstances would, according to the terms of this clause, be perfectly valid—so valid, indeed, as even to exclude the inventor himself from making use of his own invention without the consent of the person to whom he made the communication! For although in the first part of the clause it is said that the patent must be taken out "with the consent of the inventor," yet in the latter part it is merely provided that the "letters patent shall contain a recital *that the said invention hath been communicated or sold* to the person to whom the said letters patent are granted"—not a word being said as to the consent of the inventor having been obtained, nor even so much as provision made for the mention of his name in the patent. The omission, it must be confessed, is a very remarkable one. If it arose from design, it is most unfair; if from oversight, most discreditable to the legislative skill of the framers of the Bill. It is afterwards, to be sure, provided, that if "any fraud has

been used," the patent shall be void; but how could any fraud be established in the case of a person communicating an invention to another withou tany stipulation whatever as to the use to be made of it? And if fraud could be established, would that give back to the inventor the secret of which he had been defrauded? Observe, farther, that it is to be sufficient if the letters patent contain a bare recital that the invention has been "communicated or sold to the person to whom the said letters patent are granted." *No proof whatever of the truth of this recital, or of the fulfilment of any conditions that may have attached to the sale, is to be required.* The sale may have been merely verbal—perhaps only an inferential interpretation of words loosely spoken by one party in haste or in jest, and taken by the other in good and deliberate earnest; it is to suffice if the party who applies for the patent, and *who is to have all the benefit of it*, affirm that the invention was "communicated or sold" to him. Again, the communication or sale of the invention may have been made in consideration of a sum of money to be paid by the person who takes out the patent, and that money may never have been paid; no matter, the patent will stand as good as if it had. The inventor may have his right of action against the patentee for the recovery of the money, but the patent itself he cannot overturn. And if he could, he would gain nothing by so doing, for though the patent might be declared void, the invention would not revert to him—according either to the law as amended by this Bill, or to the law as it now stands—but would remain the common property of the public.

Had the authors of the Bill, in short, put their heads together to contrive how they might best expose inventors to be circumvented and cheated, they could not have framed a clause better calculated for the purpose; and yet, forsooth, this is called a Bill "to secure the property" in inventions to the inventors! Security to patentees there is in abundance, but none whatever to inventors.

The way to effect the ostensible object of this clause—which is simply to enable the assigns of inventors to take out patents in their own names, and at the same time to secure to inventors the fruits of their ingenuity—is so plain, that the wonder is how it could *be designedly* missed. Why not provide that there should be an assignment in writing from the inventor to the person applying for the patent? And that such assignment should not only be recited in the letters patent, but filed along with them? An inventor would then have himself alone to blame if he executed the assignment without having received the stipulated consideration.

That this simple and safe course has not been followed will seem the more surprising, when it is considered that it would be but an extension of the existing law relating to copyrights, which stand on precisely the same footing, as respects the right to protection, as mechanical inventions. No assignment of literary property is valid which is not in writing, and executed with all the customary formalities; not even a receipt for a sum of money, as the agreed upon price of a copyright, will suffice to convey it; there must be an actual deed of assignment—a final signing, sealing, and delivery—before the copyright can pass. If, then, literary property is justly considered a thing of too much importance to be parted with in any other than a manner the most formal and deliberate, why should property in inventions be less favourably regarded? Is a Watt less a benefactor of his country than a Milton? Or such a machine as the power-loom less deserving of reward than a Tale of a Grandfather?

There is yet another point of view in which the clause under consideration deserves to be looked at; and that is, the effect which it would have on the *interests of the public.* The only ground on which it can be considered good for the community at large, to encourage the taking out of patents, is that it may cause many new and useful inventions to be made public which might otherwise be lost forever. And to prevent, accordingly, as far as possible, the taking out of patents for inventions that are neither new nor useful, it has been hitherto required, first, that every applicant shall *make oath* that he is, to the best of his knowledge and belief, "the *first* and *true*" inventor of the thing for which a patent is solicited; and, secondly, that the thing must be useful as well as new. Now observe how this important safeguard is got rid of by the present bill:—It is declared that if "any person shall communicate or sell any invention of which he is the inventor to any person whatsoever," that other per-

son may take out a patent for it "Any invention," be it observed; no matter whether useful or not useful, whether meritorious or in the last degree trivial. And the person who communicates or sells the invention need not be "the first and true inventor," for the words "first and true" have been left out. The thing may have been repeatedly invented before; but if, so far as he is concerned, it is original, then he is to be entitled to give another a right to take out a patent for it (a right, by the way, which, strange to say, he could not exercise himself under the authority of any clause in this bill!) Nor is this all; the person who communicates or sells the invention is not even required to swear that it is original, so far as he is concerned, or indeed to swear any thing at all about it; it is to be enough that the person applying for a patent for an invention *represents* that he obtained it from some other person, who *represented to him* that he was "the inventor"!!!

That the conseqnences of all this laxity of practice must be a vast multiplication of useless and unfounded patents, most vexatious to individuals, and most injurious to trade, no one can reasonably doubt. We are unwilling to suppose that the authors of the bill could have deliberately contemplated such a sacrifice of the public interest. But if the public were not to be the losers by the omission of the words "first and true," and "new and useful, *who were?* The omission is of too remarkable a kind to admit of our ascribing it to mere accident or oversight.

Clause Second.

"And be it further enacted, that any person introducing for the first time, from places out of his Majesty's dominions, any new invention, such person shall, for the purposes of this Act, be deemed to be an original inventor."

Here we have a partial return to the phraseology of the existing law; the invention introduced from abroad must be "new." But why not also "useful"? Can any good reason be conceived for inserting the one phrase and not the other?

To entitle the importer of an invention from abroad to a patent, it should not only be new and useful, but it should also be provided that no account of it *has previously* appeared in any English *or foreign publication*. We believe that many instances could be adduced of persons exercising the privileges of patentees by mere right of translation.

Clause Third.

"And whereas doubts have arisen respecting the subjects for which patents ought lawfully to be granted, Be it further enacted, that every new engine, manufactured article, article of sale, and material thing produced artificially; secondly, every new process used in making or obtaining any new or previously known engine, manufactured article, article of sale, or material thing produced artificially, even if such process be only new as applied to the particular engine, manufactured article, article of sale, or material thing produced artificially, in question, or any part thereof; thirdly, every new application of any known engine, manufactured article, article of sale, or material thing produced artificially, or process requiring some new modification, combination, or arrangement for the purpose of such application; and, fourthly, every improvement on every known invention, manufactured article, article of sale, or material thing produced artificially, or on any known process; shall be the subjects for which letters patent shall be granted. Provided always, that nothing in this Act contained shall extend to allow any person to use the whole or any part of any invention for which letters patent have been granted and are still in force, for the purpose of any improvement of which such person may be the inventor, without the consent in writing of the patentee."

The professed object of this clause is to remove certain "doubts which are said to have arisen respecting the subjects for which patents ought lawfully to be granted;" and certainly, if the way to clear up the meaning of one set of terms be to substitute another of the vaguest description imaginable, arranged in the worst order possible, the framers of this clause must be allowed to have succeeded to admiration. But the clause aims at a great deal more than the mere removal of doubts as to the existing law; for its inevitable effect would be to *change the existing law altogether*.

Of this much, at least, there never has been any doubt, that, according to the law as it stands, no invention can be the subject of a patent which is not useful as well as new. But, according to the law as it is here proposed to be altered, the usefulness of the thing is discarded altogether from consideration! The thing patented is to be "new"—that is

all. In this, as in the two preceding clauses, the word "useful" has been *purposely* dropped. We beg again to ask for what good reason? Is it to benefit trade, or to deal justly by any one, that the doors of monopoly are to be thus thrown open to inventions of every conceivable description, and of every assignable degree of merit?

Mark, again, the extraordinary comprehensiveness of the terms employed to designate the subjects for which patents may be taken out. "Every new manufactured article," "every new article of sale," and "every new material thing produced artificially." We should like to know what there is new in the most trifling respect—new even in point of date merely, from the last new shape of a hat to the last variety in fancy bread, which might not fairly come under one or other of these denominations. No one will pretend to say that such things can be patented under the existing law; and yet this Bill we are told is merely declaratory of what the existing law is! Would it not have answered the apparent purpose of the framers of this Bill better to enact in brief, that every thing shall be the subject of a patent which any body may choose to appropriate to himself? Rare times then for patent agents!

We do not dispute that some better definition than any to be found in our books of law of the qualifications for a patent is wanted; but we take it to be manifest that we must wait yet awhile to see it supplied, and look for it to persons of very different views from the framers of the present bill.

Clause Fourth.

"And whereas it hath frequently happened, to the great prejudice of inventors, that on the trials of issues relating to letters patent, evidence has, for the purpose of shewing a want of perfect novelty in the invention, been given of a use, prior to the granting of letters patent, of the subject of the patent, in an imperfect state or manner, privately, or at a period long anterior to the date of the letters patent; be it further enacted, that letters patent shall not become void, although the subject of the patent shall have been used privately, or in an imperfect state or manner, nor if the same subject shall not have been used in a public manner practically, and not merely by way of experiment, within ten years next preceding the *date of the said letters* patent: *provided, nevertheless, that* persons who shall have privately used or practised such subject of a patent, whether perfectly or imperfectly, shall be allowed to continue to use or practise it in the same degree of perfection, and to the same extent, but no farther."

This clause remains nearly as it stood originally in the Bill, and is still open to all the strong objections which we made to it in our remarks of the 20th April last (p. 27), and to which we beg leave to refer. That such a clause should have passed unaltered the House of Commons excites our unmixed astonishment. We repeat, and challenge inquiry into the truth of our position, that it must of necessity lead to "much robbery, both of individuals and of the public," and can be of service only to ignorant pretenders and speculating knaves.

Clause Fifth.

"And whereas it sometimes happens that omissions or errors are accidentally or unintentionally made in the patent and the specification, whereby patents are rendered void; be it enacted, that every such patent, or the specification enrolled in compliance with the conditions thereof, as is or shall be deemed to be bad in law as to part thereof, whether from want of novelty, insufficiency of description, or from any other cause, shall not on that account be deemed bad in law as to the remainder thereof."

For some insuperable objections to this clause, we must also refer to our former remarks (p. 29). It may seem at first sight to be an extremely equitable thing, that the badness of one part of a patent should not vitiate the whole; but if the reader will do us the favour to peruse attentively what we before said on the subject, we think he will be satisfied that, though considerable hardship to individuals may occasionally arise from the existing rule of law, it does not deserve to be put in comparison with the injury which the proposed relaxation of the practice would occasion to the public.

Clauses Sixth, Seventh, and Eighth.

"Provided always, and be it farther enacted, That if upon the trial of any issue in or directed by either of the superior Courts of Record at Westminster, in which the validity or sufficiency of a patent or specification shall come in question, it shall appear to the jury that the patent or specification has been made, or left, or continued erroneous, defective, or insufficient in description, for the purpose of defrauding the public of the full

benefit of the invention, or of deceiving any person, then and in such case the said patent shall be and be deemed to be null and void to all intents and purposes whatsoever: Provided always, nevertheless, that if the jurors by whom such issue as aforesaid shall be tried shall find that the title to such patent, or such original or amended specification, was erroneous, defective, or insufficient in description, but without fraud or intention to deceive, that then and in such case it shall be lawful for the Lord High Chancellor, or Keeper of the Great Seal, upon petition made to him, stating the several facts of the case, and the finding of the jury, to direct such alteration in the title of the patent, and in the said specification, or either of them, as shall truly describe the invention, of which application notice shall be given twice in the London Gazette.

"And be it further enacted, That all such further and amended specifications as are by this Act directed, shall be written each on parchment, having a stamp impressed thereon of equal value with the stamp which would at the time be requisite on an original specification, and shall be indorsed in like manner as original specifications are now enrolled.

"And be it further enacted, That the court or judge before whom any proceedings at law or in equity shall be taken upon any letters patent, shall have power, and are and is hereby authorised, to amend the title or specification in all matters of form."

These three clauses are dependent on the fifth, and to be judged of by the same considerations.

Clause Ninth.

"And whereas it has been the practice to make the title to a patent so vague and general that the public have been unable to know for what particular object the patent was sought, whereby caveats have been unnecessrrily multiplied, and other incouveniences have been occasioned; be it farther enacted, that every person applying for a patent shall in his petition give a title to the invention, containing such an outline or sketch thereof as will convey a clear and distinct idea of its nature and object."

A good clause, but founded on a recital, only one half of which is true. As caveats must of necessity precede the patents against which they are directed, it is clear that they cannot possibly be affected by any vagueness of expression in what is to come after them.

Clause Tenth.

"And be it farther enacted, that letters patent shall, for the preservation of the property in the invention, begin and take effect, and the term of the patent shall begin and the letters patent shall bear date, on the day of presenting the petition for the patent at the office of the Secretary of State for the home department."

The making the letters patent "bear date on the day of presenting the petition," may lead to this practical absurdity, that they may run in the name of a different King from the one reigning at the date of the patent. The object of the clause would not be injured by the omission of this inconvenient provision.

Clause Tenth.

"And whereas the use of the property in letters patent is limited without any corresponding advantage to the public, be it enacted, that every person to whom letters patent for an invention shall have been granted, shall be at liberty to assign or transfer his interest in the same letters patent, and to grant licenses to make or use the invention for which the same shall have been granted, in any manner or to any number of persons he may think fit."

We believe that the object contemplated by the introduction of this clause was to enable a greater number of persons to hold a right to a patent than can be united in partnership according to the laws of England—to enable patents, in short, to be jobbed by joint stock companies. Indeed, it *can* have no other object than this; for there is nothing in the law of patents, as it now stands, to prevent a patentee from granting licenses "to any number of persons he may think fit." Now, since such was the object, why not avow it openly? The only words in the clause which could possibly comprehend it are the words, "in any manner." But who could suspect, at first sight, that they covered so important a meaning? And only think of the House of Commons—the *reformed* House of Commons—legislating by *stealth* in this way! We do not imagine, however, that the words "in any manner" would be considered in law sufficient for the intended purpose; and, certainly, if patents are to be granted for any and every thing, as proposed by the preceding clauses, it would be greatly to be lamented were so equivocal a phrase capable of inflicting upon the trade of the country so enormous an aggravation of the evil.

Clause Eleventh.

"And whereas great delay, inconvenience, and expense have arisen in conse-

quence of a patentee being obliged to sue in a court of equity pending a suit in a court of common law, be it enacted, that the plaintiff in an action in a common law court may by motion in that court, or by application to a Judge thereof, obtain an order to stay the defendant from making or using the invention, unless an account be kept of the sale or use thereof, to be verified on oath, and rendered periodically at such times as such court or Judge shall direct.

Clause Twelfth.

"And be it farther enacted, that whenever the defendant in any action on a patent shall plead the general issue, except in proceedings by writ of *scire facias*, he shall deliver with the plea a notice of all the objections and defences upon which he intends to rely at the trial of the issue.

Clause Thirteenth.

"And be it farther enacted, that either party may obtain an order of the court in which such action is brought, that the jurors who are to try the issue may examine the specification and accompanying drawings, at least two days before the day of trial."

Every person in the least acquainted with the practice of the courts must marvel greatly to see such a provision as this introduced. "The jurors who are to try the issue" cannot, according to the existing practice, be known *until* "the day of trial" arrives. But suppose the case to be otherwise—the jury to be fixed beyond chance of change more than two days before the trial, and the order to be obtained that "they *may* examine (not *shall* examine) the specification and accompanying drawings"—how many of them would be likely to take the trouble? And if they did not all make the previous examination, what would be thought of a verdict delivered by parties who had not all equal opportunities of judging of the matter at issue?

Clause Fourteenth.

"And be it farther enacted, that this Act shall come into force and take effect from the passing thereof; and that all the provisions therein contained shall apply to all letters patent then unexpired, as well as to all letters patent thereafter to be granted.

Clause Fifteenth.

"Provided always and be it enacted, that nothing in this Act contained shall apply to any letters patent in any case in which any infringement of such letters patent shall be proved to the satisfaction of the jury in an action at law, or of the court in a suit in equity, except any action or suit the foundation of which shall be a writ of *scire facias* to repeal letters patent to have been mad by either or any of the parties to such action or suit before the 1st day of June next after the passing of this Act.

Clauses Sixteenth and Seventeenth.

"And whereas by an Act made and passed in the 26th year of the reign of his late Majesty King George the Third, intituled, 'An Act for the Encouragement of the Arts of Designing and Printing Linens, Calicoes, and Muslins, by vesting the properties thereof in the designers, printers, and proprietors for a limited time,' continued by an Act made and passed in the 34th year of the reign of his said late Majesty, the property in the patterns or designs for such purposes is secured to the inventors thereof for a limited time: And whereas it is expedient that original patterns for other purposes shall be secured to the inventors for a limited time, and that the time limited by the said Acts be in all cases extended; be it enacted, that the inventor or designer of *every new pattern to be applied to any manufactured article, or to be used in the manufacturing of any article*, his executors, administrators, and assigns, shall have the exclusive right to use the same pattern for and during the period of twelve calendar months next after the same shall have been made public.

"And be it further enacted, that all and singular the clauses, provisoes, and regulations in the said before-mentioned or recited Acts contained, shall extend and apply to all new patterns to which they shall be found to be applicable, save and except such parts of the said recited Acts as relate to the giving the special matters in evidence under the general issue, which parts are hereby repealed: provided, nevertheless, that the defendant in any action brought under the said recited Acts, or either of them, or this Act, shall with his plea deliver a notice of all the objections and defences upon which he intends to rely at the trial."

We have before seen that, by the third clause of the Bill, "every new manufactured article," "every new article of sale," and "every new material thing produced artificially," may be the subject of a patent for fourteen years; and as there can be no manufactured article of a "new pattern," which will not come under one or other of these designations, it may be asked—Why now introduce a clause limiting the property in such patterns to twelve months? We can suggest no other answer than this—that the framers of the Bill could never have intended that new patterns should come

within the operation of the prior clause. We think this very likely to be the case, but our business is with the Bill as it stands, without any reference to the intention of its framers—we must construe its words according to their plain and obvious meaning, and we defy any man so to construe the third clause as to exclude new patterns from its operation. Is not every manufactured article of a new pattern a "new manufactured article?" Or at all events "a new article of sale?" Were the Bill, then, as it is, to become law, the inventors of new patterns would be in this extraordinary situation, that they might either take out letters patent for fourteen years at a considerable expense, or avail themselves of the limited monopoly for twelve months conferred upon them by clause sixteenth, without the intervention of letters patent, and at no expense at all. So much for people meddling with legislation, who have not even the skill necessary to prevent one part of an Act clashing against another!

An important question still remains to be considered, which is this—Ought the inventors of new patterns to have any exclusive privilege at all? The statutes recited in clause sixteenth give the inventors of new patterns in "linens, calicoes, and muslins," a monopoly thereof for three months; and certainly, if it be right that articles composed of flax and cotton should be protected, no reason can be assigned why articles composed of wool and silk, or of any mixture of these articles with flax or cotton, should not be equally protected. But if new patterns in wool and silk are admitted into the circle of monopoly can we stop there? Clearly not; for there is not an argument which can be urged in favour of the workers in flax, cotton, wool, and silk which may not be urged with equal effect in favour of the workers in gold, silver, iron, brass, wood, ivory, leather, hair, wax, paper, dough, clay—in short every other workable substance whatever. Nay, often with far greater effect; for if there be ingenuity worthy of national encouragement in such villainous representations of fruits and flowers as commonly disfigure our cotton and linen fabrics, there is ten times the ingenuity displayed in the admirable imitations of apples, pears, potatoes, turnips, walnuts, acorns, &c., common to our confectioners' and bakers' shops. The reasoning, then, by analogy leads us to this, that new patterns of every kind and degree should be protected; and this is precisely what the present Bill proposes to accomplish, for it enacts "that the inventor or designer of EVERY NEW PATTERN to be applied to ANY manufactured article, or to be used in the manufacturing of ANY article, shall have the *exclusive* right to use the same pattern for and during the period of twelve calendar months next after the same shall have been made public." Now we do say that rather than so universal an invasion of the freedom of trade should be suffered, it were better far that the utmost degree of ingenuity which can possibly be exhibited in the designing of a pattern should go wholly unrewarded. The general industry of the country must not be ruined that pattern designers, however ingenious, may thrive. The truth however is, that the value of a pattern in the market depends as often on mere whim and caprice as on any ingenuity displayed in it. An ancestor of the present Chancellor of the Exchequer was persuaded by his tailor to wear a surtout with the tails cut off, and for a time spencers were all the fashion; had the present Bill been then the law of the land, his lordship's tailor must, even in a twelvemonth, have made a prodigious fortune of this mere trick of the shears. After the taking of Gibraltar, the only sort of lollipop in vogue with the suckling Elliotts of our warlike isle was *Gibralter rock*; but there were no Godsons in those days, and the consequence is, that the inventor of this novel and most lucrative pattern, instead of founding a family, is now forgotten, even to his very name. But what rational man regrets that the docktail pattern did not produce a *millionaire?* Or that the descendant of the Gibraltar rock sweetmeat man does not "nod from t' other bench" to the heir of the illustrious hero of the Rock?

Since, therefore, no line of separation can be drawn between patterns meritorious for their ingenuity, and patterns that possess no merit whatever beyond mere novelty—since by far the larger portion of all patterns are of the latter description—and since no distinction ought to be made between the patterns of one branch of trade and the patterns of another, we feel constrained to come to the conclusion, that monopolies for patterns of every kind should be utterly abolished,

Clause Nineteenth.

"And be it enacted that in every action or suit in which the validity or sufficiency of letters patent for an invention, or of the specification, shall come in question, the costs to be paid by either party to the other shall include such costs of necessary scientific witnesses as the Master or Prothonotary of the Court may in his discretion think fit to allow."

Clause Twentieth and last.

"And be it further enacted that this Act shall extend to Scotland and Ireland.

So much for the Bill which has passed the House of Commons. One word more before we conclude, as to the Bill which was abandoned—that which proposed to "lessen the expense of obtaining patents." The only clause in that Bill which related to the "price of patents" is conceived in these terms:—

"And be it further enacted that the fees payable for letters patent granted for the term of seven years, shall be two thirds of the fees which shall be paid upon letters patent granted for fourteen years."

This, however, is clearly no reduction of expense, since there is far more than a corresponding reduction of the period for which the cheaper patent is to be granted. The reader will perceive therefore that there was to be *no* lessening of the enormous expense of patents by either the one Bill or the other, although confessedly it is that part of the existing system which most of all requires amendment. The interests of the poor inventor have, in short, been most deliberately and wantonly sacrificed—but of this more hereafter.

THE UNDULATING RAILWAY.

Sir—I cannot help thinking that the author of the undulating railway has fallen into some grievous errors, both on the subject of motion and of friction. He says at page 149, "if the carriage press upon the horizontal line E A, with a force equal to 5 tons, and if C D be equal to $\frac{1}{5}$ the force of C P, the amount of pressure upon the rails, either on the ascending or descending plane, is only 4 tons." When I saw this, I was certainly astonished, for I know but little of mechanics, and concluded that the other ton floated in mid air. Now, as a ton weight is a ponderous body to float in the air, I pondered a little on the subject, and the following are the conclusions I came to. When the carriage rests upon the plane, whether upon the ascending or descending line, I admit that it will only press the plane with a weight of 4 tons, but the other ton must be supported by a prop, or in some other mechanical way; but when the carriage is in motion it will sometimes press the plane with less than 4 tons, *because the weight is descending*, and if it could be made to descend at a certain rate it would not press the plane at all. Now, at the lowest part of *a curve* it will press the rails with more than 5 tons, and the direction of its motion will be horizontal and a straight line, which is the natural path of all moving bodies; where the carriage ascends the curve, it will press with more than 6 tons, because of the tendency which all bodies moving in circles have to recover their natural path. The carriage in this case has a tendency to move horizontally, and is prevented by the ascending curve, and the velocity might be so great as to cause a pressure of 10 tons, or, in fact, almost any conceivable pressure. Every part of the curve will feel the effects of this velocity, and gravity will cause the inequality of pressure stated above. From these and some other considerations, I have not the least doubt that the whole amount of friction is more on the undulating than on the horizontal railway. As there is more friction on an undulating than on a horizontal railway, more power will be required to move a carriage upon it, and it is therefore inferior to the horizontal railway. There is a question in this affair which I should like to see well answered, namely—whether the same power can overcome the same friction in less time upon the undulating than upon the horizontal railway? I think not, but I believe that a carriage moving at an uniform rate of ten miles an hour on a horizontal railway will traverse a curve in less time than it would have reached the same point had the railway been uniformly horizontal; but it will leave the curve at a less velocity than it had when it entered it: this decrease of momentum shows an expenditure of power. Junius Redivivus has treated this subject in a masterly manner, and when the experi-

ment he has proposed, p. 119, shall have been tried, it will be seen who is right,—Mr. Badnall or his opponents. The experiment related, p. 180, by T—s H—d, is very much against Mr. Badnall's theory. I believe there is an error in the printing where this correspondent says, "farther and faster on the curved line." It should be, if I mistake not, "farther and faster on the horizontal line."

Your obedient servant, W. W.

Newcastle, Staffordshire,
12th July, 1833.

Rotary Engine.—Sir, I have devised a plan for a rotary engine, which may be put in motion by steam or water, and possesses the following qualities:—The steam (or water) exerts its influence in a direction best calculated to transmit its power undiminished to the machinery to be put in motion, and during every position of the pistons acts with uniform force, thereby producing a force perfectly equable and continuous. The friction, by a peculiar method of rendering the cylinder steam tight, is reduced to a trifling amount. To these may be added extreme simplicity of construction, as the constituent parts of the engine are few in number, there being no valves, eccentric motion, or fly-wheel. As the action of the parts is in perfect accordance, no increased friction is produced, as is the case with Mr. Ericsson's cone and plate engine, described in your work. If such an engine be a desideratum, (should any of your readers, who may be able to turn it to a practical account, be disposed to offer me some small remuneration,) I would willingly communicate my scheme, as I have not the means to make it useful to myself. I have not made a model, but have no objection to do so if one should be required. If you will insert the above in the Mech. Mag., to which I am a subscriber, you will greatly oblige, Sir, your obedient servant, A. B. C., Post Office, Cambridge.

The Burning Cliff at Holworth (fully described in the Mechanics' Magazine of 15th January, 1831), has during the last fortnight become more immediately interesting from the extraordinary quantity of vapour expelled from the numerous fissures which so abundantly present themselves on its summits and side. The internal agitation has evidently much increased of late, and is visibly extending its influence and making progress westward. Many additional apertures have within a short time become apparent, and are pouring out a profusion of very strong sulphureous exhalations. —*Dorset County Chronicle.*

LIST OF NEW PATENTS GRANTED BETWEEN THE 22D JUNE AND 22D JULY, 1833.

Charles Terry, of Shoe-lane, London, merchant, and William Parker, of New Gravel-lane, Shadwell, merchant, for improvements in making and in refining sugar. June 26; six months to specify.

Charles Terry, of Shoe-lane, London, merchant and William Parker, of New Gravel-lane, Shadwell, merchant, for improvements in refining and purifying oils. June 26; six months to specify.

John Christopher, of New Broad-street, London, merchant, for an improvement or improvements on anchors. June 27; six months to specify.

George Beale Brown, of New Broad-street, London, merchant, for certain improvements in machinery for making or manufacturing pins of the kind which are commonly used for fastening wearing apparel, being a communication from a foreigner residing abroad. June 27. (The time to enrol is not specified in the list furnished us.)

Christopher Piggott Banks, of Bewdley, Worcestershire, brass founder, for an improvement in the manufacture of certain culinary and chemical utensils and vessels. June 29; two months to specify.

Alexander Mitchell, of Brickfield, in the parish of Ballymacarrett, county of Down, Ireland, civil engineer, for a dock of improved construction, to facilitate the repairing, building, or retaining of ships, and other floating vessels. July 4; six months to specify.

William Crofts, late of Lenton, but now of Radford, both in Nottinghamshire, mechanic, for certain improvements in machinery for making bobbin net. July 4; six months to specify.

William Newton, of Chancery-lane, London, civil engineer, for certain improvements in machinery called roving frames, for roving cotton and other fibrous substances, being a communication from a foreigner. July 11; six months to specify.

Augustus Applegath, of Crayford, Kent, calico printer, for certain improvements in letter-press and block printing, and in the machinery or apparatus used for the same. July 18; six months to specify.

John Squire, of Paddington Basin, engineer, and Francis Maccerone, of Upper George-street, Bryanstone-square, for certain improvements on boilers for generating steam. July 18; six months to specify.

John Livesey, of Bolton-le-Moor, Lancashire, paper manufacturer, for certain improvements in the preparation of hemp, flax, and other fibrous material for the manufacture of glasing, friction, and mangle bowls, paper-makers' felts, and other purposes. July 18; six months to specify.

INTERIM NOTICES.

We shall be very glad to see Captain Loochoo at our monthly conversazione; but according to our calendar, the last Wednesday of the month is not the 24th, but the 31st.

"A Poor Inventor's" recommendation to us, to call upon all who are desirous of averting the serious evils threatened by Mr. Godson's Letters Patent Amendment Bill, to petition the House of Lords forthwith, came too late to hand to be adverted to in the article which we have this week devoted to the subject. We say—*petition by all means.* We may here add that, since writing that article, we have been informed that, just previous to the third reading of the Bill, two or three material alterations were made in it, which do not appear in any of the printed copies of the Bill furnished to the members of the House of Commons; and that in particular the third clause, to which we have objected so strongly, was dropped entirely. The copy of the Bill on which our remarks are founded was that issued after the Bill was sent up from the committee, and after it had received (as was supposed) the last finishing touch of its authors.

Communications received from Pit—E.—W. M.—Mr. Booth—S. Y.—P. M.—H. L. L.

Erratum.—P. 212, col. 2, l. 4 from the bottom, for "all heights" read "all lengths."

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MALLET'S APPARATUS FOR COOKING BY GAS-FLAME.

Fig. 1.

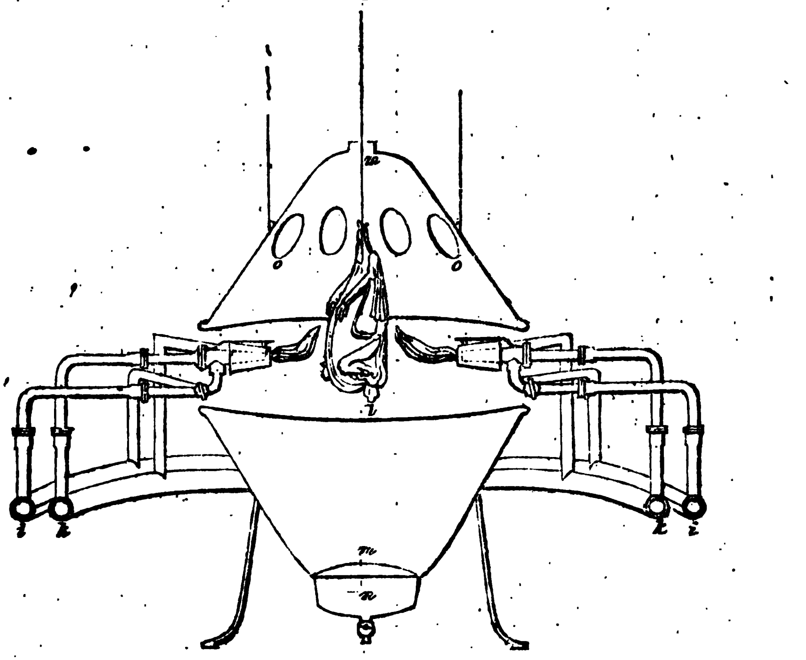


Fig. 2.

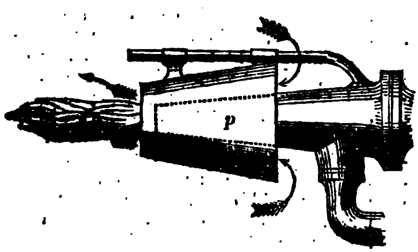
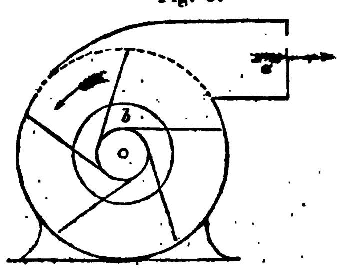


Fig. 3.



MALLET'S APPARATUS FOR COOKING BY GAS FLAME.

We extract from the last part of Mr. Loudon's "Encyclopædia of Cottage, Farm, and Villa Architecture," the following account, by Mr. Mallet, of Dublin, of an apparatus for cooking by gas flame, which he considers superior to that of Mr. Hicks:—

"Cooking by gas flame is a thing which has long floated in my head, but which I have said nothing of, lest the folks should suppose me "daft," as they say in your country. Some few years ago I had occasion to make some weldings of iron, where it is an important object that the metal should not be burnt away in the fire; for this purpose I endeavoured to use a kind of huge gas blowpipe. I got one made of the kind shewn in fig. 4, as far as each jet is concerned, but of a much larger size. In this figure *a* is the air tube; *b* is the gas tube; *c* the gas cock; and *d* an end view of the point of the blowpipe, in which *e* is the circular orifice for the emission of air, and *f* that for the emission of gas. Mr. Daniell, of King's College, London, has since published the same thing as new, and of his invention; however I can establish priority by my laboratory journal. To proceed, the jet or blowpipe is so made that a current of atmospheric air is forced into the centre of the gas flame, by which means the latter is converted into a blowpipe of great power. Instead of a mere circle of gas burners I use a certain number of such blowpipe flames, arranged as radii of a circle, as in fig. 5, in which *g* is the air pipe, and *h* the gas pipe; and each of the branches to the jets from these pipes has four small collars of leather, or stuffing boxes, so that any one can be approached to or drawn from the centre of the circle, or raised or lowered, as occasion may require. Fig. 1 is a sectional view of such an apparatus complete, in action; a circular main tube, *i*, supplies the gas to all, and another, *k*, supplies the current of air, the means for producing which I will describe hereafter. The article to be roasted, *l*, is suspended from a bottle jack, but with a swivel such as those used by anglers interposed, so that it may be permitted to turn, or be stopped, the jack still going on as may be required. Above and below it are parabolic plated copper reflectors *m m*; the lower one with a receptacle for dripping *n*; and the upper one with six or eight discs of plate glass inserted in proper places to enable the operator to view the process of cooking. Each burner has a copper cone *p*, placed so as to slide over it, by which means the radiated heat, convergent on the roasting matter, a current of hot air is continually urged against it, as shewn more fully in fig. 2. The upper reflector is hung by balance weights, so as to throw up in a moment; and besides a cock to each individual gas tube of each burner, there is a general one to each of the air and gas main tubes, so as to diminish the heat generally, or in any particular spot.

"The advantages of this arrangement over that of Mr. Hicks appear to me to be, a much greater economy in fuel (as the waste heat in the upper reflector may be collected and conveyed away in a tube, and applied for the purposes of heating water, &c.); perfect combustion, at a greatly increased temperature (viz. one sufficient to melt wrought iron), without any smoke; the means of a more perfect regulation, application, and adaptation of the heat to any given substance; better form for the reflectors, and less escape of heated air by them; the application of copper funnels to the burners, by which a continuous current of hot air is urged against the article being roasted; and the capability of adapting the cordon of burners to an irregular mass, at equal distances every where.

"The expense of this apparatus is far greater than that of Mr. Hicks, but fewer sets of apparatus will answer by this than by that mode; for the common circle will only suit things of nearly the same size, while my apparatus may be applied to any thing that can be admitted [illegible].

"The current of air may be produced by means of fanners, such as are occasionally used for producing a blast on a large scale in iron founderies. These are either worked either by a common jack (a smoke jack), or any other power at hand. The fanners are simply a few vanes of sheet iron, revolving with great rapidity (1500 times per minute) in a cylindrical case, with a lateral aperture for the [illegible], and two others at the axis for the [illegible]sion of air, as in fig. 3. The [illegible] set tangentially to the axis, and [illegible]volve, that by communicating a centrifugal force to the air in the cylinder it is expelled at *a*, and fresh [illegible] [illegible] Daniell proposed [illegible] hot tube, for the purpose of this blowpipe, which would certainly be an improvement, and could readily be done by inserting the tube in the kitchen fire.

"Blowpipe flames for boiling or stewing may be made on the same principles, [illegible]

Fig. 4.

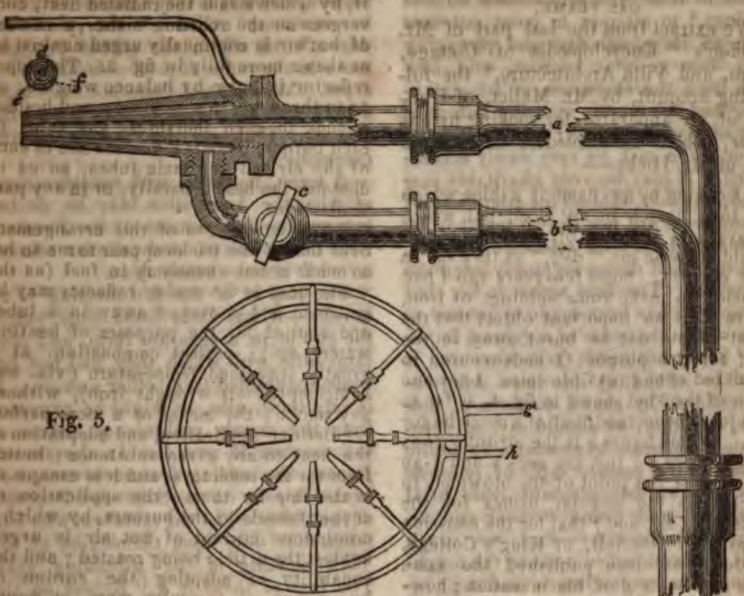


Fig. 5.

cally, will do; all that is necessary is, that several concentric alternate tubes of gas and air may be burnt. But I do not conceive cooking generally by gas, in the present state of the gas manufacture, and consequenthigh price of gas, economical. I, however, esteem it admirably applicable to cooking wild fowl, and similar exquisite *morceaux* of *gourmanderie*. When gas is publicly made from the decomposition of water (and I think the time is not far distant when that will be the case), it will be a cheap fuel for many purposes."

Remarks by Mr. Loudon.

"We do not offer an opinion on Mr. Mallet's plan for cooking by gas, as compared with that of Mr. Hicks; but the more we see and hear on the subject generally, the more we are convinced that the time is not far distant that cooking by gas will become common in all towns where gas-lighting is employed. Our correspondent, Mr. Robison, informs us, that Messrs. Steele, brothers, ironmongers in Edinburgh, are about to erect a kitchen for a gentleman in the neighbourhood of that city, on the plan given in p. 714 of this work, but substituting gas stoves for the coke fires, and adding a roasting and baking oven, both heated by gas. A canopy is to be put up over the cooking hearth like the sounding-board of a pulpit, and its apex is to be connected with a flue in the kitchen wall, by which means all smells produced by cooking will be carried off as fast as generated. Mr. Milne, an eminent brass-founder in Edinburgh, who has had great experience in fitting up gas apparatus, both in England and Scotland, is of opinion that, in the city just mentioned, gas, in the better class of houses, will soon take the place of coal fires, not only for cooking, but also for heating. We have lately seen not only roasting, but boiling and stewing, performed at Mr. Hicks', and earthenware cones and radiating discs substituted for metallic ones, in a similar manner to that suggested by Mr. Mallet. For broiling, a disc is substituted for a cone."

THE BRITISH SCIENTIFIC ASSOCIATION.

We shall not, at least just now, attempt to solve the not unimportant or uninteresting question, How far the "British Association for the Advancement of Science" is likely to promote the object for which it is professedly instituted? It is

not necessary, perhaps, in reviewing the Report of their first and second annual meetings,* to attempt to point out how much of its popularity and prosperity arises from genuine sources, and how much from the showiness of its pretensions, and the merely amusing nature of many of its exhibitions; nor, if it were so, could the task be very easily accomplished. It may be very charitably suspected, however, that *all* the attendants of its congresses are not drawn together by an unmixed love for scientific research, or an unmixed desire for purely scientific instruction. The fact seems to be, that the congress has been made to assume so much of the character of a genteel fair—the "heavy business" (which no one is forced to attend to) has been so agreeably relieved by grand displays of fireworks, or rather, we should say, *of* pyrotechnical science—by comfortable public dinners (with *quant. suff.* of *scientific* toasts afterwards)—pleasant little rural excursions—and grand "vocal and instrumental" concerts†—that we much fear it has been looked upon by the neighbouring country gentlemen and their ladies a great deal in the light of an additional race-week, or musical festival; and, simply on that account, hailed with delight by the softer sex especially, who we are told, make up a great part of the auditory. In a few years more, a pretty correct judgment may be formed on this point, provided the Association continues the practice of printing the names of the members; if the same names appear as subscribers, from year to year, it will serve to show that it is supported on its real merits alone: but if, as is to be feared, there should appear a new set for every meeting, it will be pretty evident that the great majority pay their sovereign, not quite so much for the purpose of contributing to the "advancement of science," as of procuring for themselves and their families a week's round of amusement—of "philosophy in sport," and not "science in earnest." The late Cambridge meeting wanted nothing but a ball to render it complete. Now, we [illegible] Plumian Professor for [illegible] ceremonies?

A truce, however, with considerations of what the Association may do, [illegible] on what it has already done.

The Report of the first meeting [illegible] novelty—it has been some time before the public in a separate form, and contains little with which they had not become acquainted from other sources. It is very short, also, as might be expected from the merely preliminary nature of the meeting it records. In the second Report, the leading feature is composed of the Reports on the State and Progress of the Sciences, by the members who had taken that duty upon themselves at the York meeting of the preceding year. The first of these is a "Report on the Progress of Astronomical Science during the Present Century," by Professor Airy, of Cambridge, who has apparently bestowed considerable pains on the elucidation of his subject. The Professor professes *not* to be one of the wise men of Gotham, who lament so dolefully the terrible "decline of science in England;" yet, withal, he gives sufficient indications that he has an inkling that way himself, even in the midst of his warmest protestations to the contrary. His view of the question is, with regard to astronomy at least, that, while we have done as much as any nation in the way of taking observations—the drudgery of the science—we have been, and are, shamefully behind in the far higher department of abstract reasoning; that, in short, we supply enough and to spare of the raw material, but do little or nothing in the way of turning it to use. In this he is, indeed, sufficiently opposed to the croaking party, the chief promoters of the British Association, who wish to maintain that we have done nothing either in one side or the other. They tell us of the wonderful encouragement given to the progress of science abroad, and [illegible] want of it at home. The [illegible]

* Report of the First and Second Meetings of the British Association for the Advancement of Science, at York in 1831, and at Oxford in 1832; including its Proceedings, Recommendations, and Transactions. London, 1833. Murray. 8vo. pp. 624.

† It is true, that at Cambridge the meeting broke up on Friday, and the Concert did not take place till Saturday; but is not this [illegible] effect as if the Concert had formed part of the original programme?

Professor Mohl, who so completely demolished the pretensions of Napoleon as a patron of astronomy, and showed how many of the foreign observatories had fallen into absolute decay; and, as to the latter, let us listen for a moment to Professor Airy:—

"We have done more than all the rest of the world to furnish materials for ascertaining the figure of the earth. This praise is to be divided, I suppose, between our Government and the East India Company. Be that as it may, I conceive that nothing which has been done by other nations can be put in competition with the arcs of meridian and parallel in England, the great arc of meridian in India, and the pendulum expeditions of Kater, Foster, Sabine, &c. But these expeditions, though they require care and prudence in the persons who conduct them, demand very little science. The vast improvement of chronometers is entirely due to the encouragement offered by our Government. I may also assert, that the observatories depending on our Government are maintained with an extent of establishment which few Governments would be willing to allow."—p. 181.

How strange, how passing strange, is this! Can it be possible that the Declinarian Philosophers have been so blind in their wrath as to reproach us for our weakness in the very point where we are most strong? It is even so. No fact can possibly be plainer than this—that, in no nation of the world, has science received so much encouragement from Government and public bodies as in England. And so far from this encouragement decreasing of late years, it has all the while been rapidly on the increase. Let us take this science of astronomy, for example:—While France maintains only two observatories, those of Paris and Marseilles, England possesses six at home—Greenwich, Cambridge, Oxford, Edinburgh, Dublin, and Armagh, and in her colonies (while other nations support not a single *one* in theirs), the number is no less than five—Cape of Good Hope, St. Helena, Bombay, Madras, and Parramatta! What more proof can be wanting?

But while the Professor allows us the credit of contributing much more than our share of observation, he laments that we do nothing in the higher and more intellectual *department of the science. Yet, almost immediately* after, he himself supplies a refutation of his own chimera:—

"I will not deny that there are some exceptions to my general assertion; and in one of these my hearers will anticipate me. I think I can fix on only two discoveries, the results of combined theory and observation, which are original in the present century, and one of these belongs to an Englishman. New planets and periodical comets had been discovered in the last century; abstract theory of every kind, and observations of almost every kind, had been produced: but the existence of a resisting medium was established in this century by Encke; and the practical prediction of the phases of double stars is due to Sir John Herschel. Nor can I omit to mention Sir Thomas Brisbane, and Mr. Baily, nor (for several investigations connected with the physics of astronomy), Mr. Ivory, and lately Mr. Lubbock. But after every credit has been given to their labours, it will, I believe, be allowed that the part in which England has contributed most to astronomy, and which is likely to be mentioned with greatest gratitude by future historians of the science, is that in which she has contributed as a nation."—p. 182.

This is a very remarkable passage altogether. An English astronomer (but crammed to the full with foreign predilections), at the very moment he is endeavouring to prove an axiom of his own—that the English are sadly deficient in the higher branches of astronomy—that they leave the field of discovery open to foreigners alone, is compelled to admit, that *one* out of the *two* grand astronomical discoveries of the century is the production of an Englishman! Does not the fact prove his axiom to be founded on a fallacy? And would he not, if any one were to assert that the Germans were behind the age in astronomy, triumphantly, if not with a sneer of contempt for the assertion, adduce the grand discovery of Encke as proof positive to the contrary? The latter part of the extract we would recommend to the serious perusal of some of the foremost leaders of the "decline of science" cry—those who assert that England contributes nothing as a nation to the advancement of science. According to Professor Airy, what we are chiefly in want of now are individual cultivators of the higher walks of astronomy; and who more fit to become so than the Declinarians themselves? True, they will say, but our country offers no encourage-

ment, not even a maintenance, for such adventurers. There are, however, some countries of Europe (as a certain distinguished Declinarian can well attest), where an income of twelve hundred a year from a Professorship, without any duties attached, (or, at any rate, performed,) would be deemed a very decent provision for a man of science, and quite enough to enable him to pursue the most abstruse researches at his leisure.

The Report on Mineralogy is almost as satisfactory, in the same way, as that on Astronomy. It is drawn up by Mr. Whewell, who gives a very elaborate description of the progress and present state of the science, and of the recent discoveries, and then observes:—

"In reviewing the account which has been given, it is impossible not to be struck with the small share which Englishmen have taken in all that relates to system in this science."

The very same complaint as before, and, incredible as it may appear, *supported* by facts of the same complexion as the Professors. The very next paragraph that we have quoted actually runs as follows:—

"With regard to optical researches, we have already mentioned that *one person* in our own country has done *incomparably more than all the experimenters of the Continent together!*"

Pretty well this, in the absence of any thing like system! Yet, after this and one or two more instances of the proficiency of Englishmen in meteorological science, Mr. Whewell puts on a grave face, and laments that "in the adoption of generalities we have been slow," that "we leave to others the glories of discovery," &c. &c. &c.; nay, he even goes so far as to observe, that "this prosecution of details, and apathy or contempt with respect to methods, appears to be a part of the intellectual character of this country!"—an assertion which we are astonished he did not proceed to bear out by referring to the Novum Organon of Bacon, or the Principia of Newton, by way of showing that the defect is so completely "bred in the bone," that we can never hope to see it rooted "out of the flesh!" But by what fact *does* Mr. Whewell support his idea? Simply *this*:—

"*The step to the best portion of its scientific character*—the doctrine of definite proportions—was made by an Englishman!!!"

A most convincing argument, truly, in proof of the position advanced! The truth seems to be, and it is becoming plainer and plainer every day, that the raisers of the "decline" outcry have been frightened, or, at least, have pretended to be frightened, at shadows; that there is no ground for such an outcry; and that, even if there were, they themselves are precisely the parties most at fault. It is unnecessary to go through the remainder of these Reports to adduce further instances that English science is not *quite* so deep in the mire as it has been represented; we need only allude to that on Geology, by the Rev. Mr. Conybeare, in which, although the writer is not disposed to allow his countrymen a straw's breadth more merit than they are entitled to, he gives to SMITH the well-earned praise of having advanced the science as much as any cultivator here or elsewhere—shows that the geology of the Continent is deeply indebted to English explorers—and designates the publication of Lyell's Principles of Geology (a work completed in this very year of the deepest decline), as of itself "an era" in the science. And how is geology to be advanced in countries where science is not on the decline? By the establishment of Geological Societies *on the plan of that* which has done so much for the last ten or twelve years *in England!*

The remaining Reports are "On Tides," by Mr. Lubbock, a subject on which the reporter has bestowed great attention—on "Radiant Heat," by Professor Powell—on "Thermo-Electricity," by Professor Cumming—on "Recent Progress in Optics," by Sir David Brewster—a long and very elaborate one on "Chemistry," by Mr. J. F. W. Johnston, so well known for his interesting accounts of the scientific congresses of Germany—and a synopsis, by Dr. Prichard, of some late "Philological and Physical Researches applied to the Elucidation of the History of the Human Species," partly translated from the French of Curier.

The Transactions conclude with an account of the proceedings of the sections; and here, as well as in the preceding portion, we cannot but regret the scanty attention paid to what is, perhaps, after all, the proudest feather in our cap—the

practical application of scientific research to the purposes of life. We might reasonably have looked, even in the first volume of the Transactions of such an "Association," for at least one Report of such a character, at a time when railways and travelling by steam deservedly occupy so large a share of the public attention. There is, however, no such report; and that part of the proceedings of the sections under the head of "The Arts," consists of a very few articles. Amongst them is a valuable suggestion by (*the late*) Mr. Bevan, for the improvement of maps by inserting the relative height, as well as the latitude and longitude of places; and a paper on the steel suspension-bridge lately built at Vienna, and the new mode of preparing the steel adopted there, which, as being well worthy of our readers' attention, we have extracted:—

"Experiments on the comparative strength of iron and steel in resisting tension have been from time to time made and published, establishing, upon unquestionable authority, that it requires more than double the force to break a bar of steel by tension, than one of iron of equal dimensions; and that three times the force is necessary to stretch a bar of steel beyond the power of its elasticity to recover itself, than of an equal sized bar of iron.

"It is also established on the best chemical evidence, that the power of steel to resist corrosion from the operation of air and moisture, is very far above that of iron. But it does not appear that advantage had been taken of these very valuable properties of steel in bridge-building, until about three or four years since, when the Austrian engineer, the Chevalier Ignace Edlin von Mitis, built a steel suspension-bridge, of 230 feet span, at Vienna.

"Having attentively examined this bridge, during the progress of building—having conversed with M. von Mitis on the subject—and being strongly impressed with the opinion that the employment of steel as a material for bridge-suspension is of very great advantage, and forms a most important epoch in bridge-building—I* am very desirous of calling the attention of the scientific world, and particularly of civil engineers, to the serious consideration of the question, How far ought iron hereafter to be used for suspension-bridges, since it is ascertained that a steel bridge can be built, of equal strength and superior durability, with one-third or one-fourth of the weight of an iron one, and at a much less expense, provided steel can be manufactured in this country upon the same principle as that made in Styria?

"The only doubt of this being practicable on the large scale, arises from the circumstance, that in this country iron is made with mineral coal, but in Styria with charcoal of wood.

"It is well known, that steel is made by decarbonising cast iron, which is a compound of iron and carbon, down to the state of tin (in which state it is wrought into bars), and recarbonising these bars up to the state of steel, in which state the iron is combined with a less proportion of carbon than was contained in it in the state of cast iron.

"Now, the Austrian improvement consists in decarbonising the cast iron down to the point at which the proportion of carbon left in the iron is exactly sufficient to constitute steel, in which condition it is wrought into bars, which are found to be of a tougher quality than steel made in the ordinary way. Thus the expense is saved of the extra decarbonisation, and the whole of the recarbonisation, and consequently the steel is produced at a much less cost than could be effected by the common process.

"But whether or not this simple operation will be equally successful upon the large scale, with mineral coal, is a problem which I would most earnestly call upon the iron-masters of the United Kingdom to lose no time in endeavouring to solve; a problem of immense consequence to a large range of the manufactures of the country, and therefore a high national object. The hope that this will be accomplished is strengthened by the fact, that many small articles are now made of cast iron, and afterwards reduced down to steel.

"The price of bar-iron at Vienna, when I left it, was 6*l.* a ton; that of bar-steel, formed from the decarbonised cast iron, 8*l.* 16*s.*

"By means of the Styrian steel, suspension-bridges may be built for less than half the cost at which they could be formed of iron; and a span of double the extent that would be practicable in iron, may safely be ventured on in steel. I have calculated that upwards of 1,000 feet may with confidence be depended on."—p. 598.

* James J. Hawkins, Esq., the author of the paper.

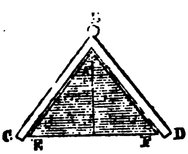
THE ART OF SWIMMING.

Sir,—In the Mechanics' Magazine of 8th June, there was a scheme for improving the art of swimming, by the

introduction of an instrument attached to the foot, to be called a "swimming shoe." This is not the first time, by a great many, that some such appendage has been thought of. I recollect, long ago, seeing a pair of clogs pretty nearly on the construction recommended by your correspondent G. W., which their inventor had found perfectly useless for their intended purpose, if not prejudicial. That projector, as well as G. W., seems to have laboured under a great mistake as to the theory of progression in swimming,—a mistake which fairly leads us to infer, that neither the one nor the other can be any great proficients in aquatic exercises, or can have attended to the motions of those who are. In order to point out where they have been wrong, I will quote a few paragraphs from a manuscript treatise on swimming, now lying before me, whose author ought to be well acquainted with the *theory* of the art, if proficiency in its *practice* may be taken as a criterion.

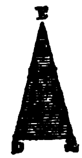
"The proper method of striking with the legs is the principal object to attain if we wish to swim well and fast: the chief part of the power acquired by the striking of the arms is expended in merely floating the body—the legs are the prime moving power, the propeller of the machine—and constant observation only serves to strengthen the fact, that, unless a person strike properly with the legs, he will never become a good swimmer. Many persons do not comprehend rightly the principle by which the action of the legs is to be regulated. It is, however, easily illustrated.

"Suppose two inclined planes meeting each other in the point A; and two levers,



BC—BD, meeting each other and connected at B. Now, if the points C and D be by any power forced towards each other, the consequence must necessarily be that the point B will be driven forward. Take the inclined planes to be the water, and the levers to be the swimmer's legs, and the cause of propulsion in swimming is easily comprehended. It can now very easily be seen why it is that those who in *striking keep their feet close together*, and *so merely paddle on*, make scarcely any way in the water; for they have only, the power derived by the resistance of the water against the upper or top part of their feet, a surface of not more than a few superficial inches, and this again almost counterbalanced by the back-water, as it may be called, against the back of the legs.

"It will readily suggest itself that it is absolutely essential to strike vigorously and spread the legs widely; for, referring again to the illustration of the inclined plane, the wider the legs are extended, the greater is the angle of the two planes at the point of union; consequently, with the same exertion of strength we acquire a much greater swiftness; for suppose the feet close together, or nearly so, the two planes form so small an angle with each other that we may kick as vigorously as we choose, and yet conquer no space. By looking at the two following diagrams,



what is here intended to be enforced will be readily understood, for the power that would raise a certain weight up AB would be totally inadequate to raise the same weight up DE; and in the case before us, as water is so easily displaced, the pressure on the inclined planes DE—EF, they being so nearly parallel to each other, would destroy the principle of resistance in the water altogether, before sufficient power could be gained to urge the weight to be moved onwards: this mobility of the inclined plane of water suggests at once the necessity that exists for striking vigorously before the principle can be destroyed."

I hope this will be sufficient to convince G. W. of his error, in supposing his invention (if *his* it may be called) could possibly prove of any use to the swimmer. His mistake is an exceedingly common one, and sufficiently accounts for the small progress he appears to have made in the "noble art." While

he continues to act on the idea, that he is to be propelled merely by the resistance of the water to the soles of his feet, he will certainly make very little way; if, on the contrary, he acts on the principles here laid down, with a stout heart and a strong leg, I have very little doubt of his soon recanting his heresies as to the difficulty and the slow progress "even of the best swimmers." This is heresy indeed, for, until now, I thought the opinion had been universal, that the ease by which a good swimmer attained celerity of motion was a most admirable spectacle. Has G. W. ever seen a "good swimmer," one who can go a distance of five yards or upwards at a stroke, which I have myself seen done, or 300 yards in 60 strokes, as a Dr. Bedale is said to have done at Manchester? I suspect not, from the tone of the beginning of his letter; and, until he has, I would advise him to proceed no further in his scheme for accelerating the movements of swimmers by tying a clog to their heels. I much doubt if any artificial adjuncts could prove of service to a finished swimmer. Thousands could be devised, effectual enough for the procuring of more power, but then they would all require more strength, and that is not always to be had for the asking.

I am, Sir,
Yours obediently,
AQUARIUS.

July 26, 1833.

NOTE BY MR. JOPLING, ON THE REVIEW OF HIS "PRACTICE OF ISOMETRICAL PERSPECTIVE."

"R." has, perhaps, been *unnaturally* harsh on the term "isometrical perpective," which Professor Farish has given to a particular projection. It is, indeed, correct projection, and no more "*unnatural*" than plain plans or elevations, which can never be seen, in any object they are intended to represent, as they are drawn.

The explanation of the "set" may be useful to those who, like "R.," use a T square in drawing, which I have scarcely ever done; indeed I have no such instrument, and I believe in many architects' offices it is very seldom used.

"R." is respectfully requested to read the 5th line on the 7th page once more, without alteration. What he has said, with respect to the application of isometrical perspective to "cities" is *unnecessary*, if not "*unnatural*," unless he has it in contemplation to represent London in that way, and does not wish any other person to make the attempt. If not this, he appears to have forgotten that the great objects of substituting "isometrical perspective" for "radial perspective," is not to make a finer picture, but that the former can be done with much greater facility than the latter, and also with greater accuracy, besides possessing the advantage of an equally distinct representation of every part

If any artist should make an "isometrical perspective" drawing of London, he, of course, will not go to the top of St. Paul's to enable him to do it. I cannot suppose that "R." would wish to say, that any artist could give a better idea of Westminster abbey, with respect to detail, and the proportion of its size to other buildings, by a view taken from the top of St. Paul's, than could be done by "isometrical perspective." The latter, of course, would be looked upon as we now do on a plan, not viewed from one point like a picture, and every part being equally distinct, any separate part could be examined, without reference to the whole.

The second "set" which "R." has represented, is quite unnecessary in "isometrical perspective."

I have studiously avoided giving long descriptions, and I shall be much mistaken if "R.'s" "shortest method," which, after being lengthened, is abruptly terminated thus—"We shall say no more, however, at present, lest we should confuse the operation,"—will be easily understood by "those who have only heard of such a book as 'Euclid's Elements.'"

In fig. † "there is a misapplication of the 'set,' fig. *." It should have been "set, fig. †,"* which I have already said is not necessary. Neither is the right line, the position of which the "set" was intended to give, or the perpendiculars drawn from it; consequently,

* This is noticed in the subjoined errata from "R." himself.—Ed. M. M.

the same right line transferred to "fig. ‡," with its marks and perpendiculars from them. "R.'s" "long habit of considering" this the easiest way may, perhaps, make it difficult for him to believe that, if the dimensions had been given, it could as easily have been drawn in "isometrical perspective," without any correctly drawn plan as with it; or with a plan, at once directly with a pair of proportional compasses.

The alteration proposed by "R." would not, in the least degree prevent that "confusion" which he wishes to avoid, while its general utility would be very much diminished. What is generally understood by "parallel perspective," and "angular or radial perspective," are both perfectly correct in principle, and consequently a fair comparison cannot be drawn between "isometrical perspective" and the "perspective of the press," the last figure in "R.'s" review, which is both false perspective and false projection. For if one face of a right-angled prism be projected as a right-angled parallelogram, only one other face can be represented, which will also be a right-angled parallelogram; and there is no advantage in this representation, in order to prevent "*confusion*," for the block, suspended by the screw, may be as distinctly seen as an internal representation, as if it were drawn in correct "isometrical perspective," which would have been done more conveniently, especially as a circle is introduced, and would have been more useful, as any person could at any time have taken dimensions in order to ascertain proportions, which, at present, none but its author knows how.

"R." appears to be under some misapprehension, when he says, in reference to the examples given in the first number, "we could have wished that the author had gone through the process of representing them." As every diagram has as many lines as was necessary for its formation, the process of drawing them it would, I submit, have been rather difficult to exhibit to him, while he remains in the dark, or to any other of those of my readers, who were not by me at the time the *compasses*, the *ruler*, the *triangle*, and the *pencil* were applied.

I would not conclude these remarks on "*R.'s*" review, without thanking him for his general and even particular approbation of the first part of "Practical Isometrical Perspective," which will, I trust, have a tendency in directing the attention of the public to the subject; and I am not without hopes of hearing and seeing that some amongst the many have applied it to purposes which neither "R." nor others have yet thought of, if those to whom it will prove useful can only be prevailed upon to make a trial, with a little patience and a little perseverance.

I remain, Sir,
Your's respectfully,
J. J.

Typographical Errata in the Review of "The Practice of Isometrical Perspective."

page.	*col.*	*line.*	
291	1	"	for "*d*" on the diagram, fig. *, insert "*a*."
292	2	6	from the bottom, for "fig. *," read "fig. †."
293	1	7	from the top, for "on," read "or."
293	2	12	from the top, for "drawing being found," read "gateway being found."
294	fig. ††		insert *a* at one end of the diagonal line which has *b* at the other end.

THE MARQUIS OF BLANDFORD'S APIARY, ON MR. NUTT'S SYSTEM.

Sir,—From the interest which you have uniformly taken in whatever relates to the extension of Mr. Nutt's invaluable system of bee management, I am induced to forward to your notice a detail of the successful results of that system, in the hands of the Marquis of Blandford, at Delabere Park, near Reading, who has gone most extensively into the subject, and with an ardour and enthusiasm which is second only to that of its intelligent inventor. As I had the permission of the noble marquis to make my observations, so I am enabled to make reference to his lordship for the accuracy of my statements; and I am only fulfilling the wishes of the noble lord in making these details as extensively public as possible, for the information of those who are interested in this most important but long neglected branch of rural economy.

His lordship's park is most delightfully situated about a mile from the romantic and retired village of Pangebourne, in Berkshire. The choice of the situation for the apiary is most excellent and delightful. It is at the top of a tower, forty-six feet high, situated

in the midst of a wood, and commanding a most extensive view of the surrounding country, including a great part of Berkshire, Oxfordshire, Wiltshire, and Hampshire, the face of nature being clad in its endless variety of fertility, and old father Thames gently meandering through the valley formed by the distant hills which close the scene, but affording few prospective traces of those immense physical developments of his powers which render him truly the monarch of rivers. On the top of this tower his lordship possesses four colonies in collateral hives, and one inverted hive, all of which have been started since April. In the collateral hives the labours of the bees have been highly successful. From one colony his lordship has already separated a box containing 30 lbs. of honey, whilst another box, along with three small glasses, which cannot contain together less than 40 lbs., are quite ready for taking, and which will afford the sum of 70 lbs., and this without infringing upon the stock necessary for their winter subsistence. Upon my examination, the thermometer in the end boxes did not exceed 70°, whilst exposed to the atmosphere it was at 64°. A most remarkable contrast was afforded by the superior quality of the honey contained in the end box over that in the "pavilion of nature;" this superiority, particularly in the colouring matter, was most evident. Mr. Smith, the intelligent keeper, who quite follows in the steps of Mr. Nutt, informed me that the average quantity of honey produced from a cottage hive, upon the old system of management, did not exceed 30 lbs. to 40 lbs., whilst only in one case did he obtain, from a hive enlarged by eking, the amount of 50 lbs. It is extremely satisfactory and fortunate that, for the sake of reference, Mr. Nutt's system has fallen into such good hands, as both his lordship and the keeper appear to be as devoted to the system as they have been happy in the results.

I am not able to speak much regarding the progress of the inverted hives, of which his lordship has two—the one being at the top of the tower, and the other on the lawn at the back of the house—the former containing twenty-three glasses, and the latter thirty-three: this last is really a magnificent construction, an *ornamental garden* appendage such as few noblemen can boast. The bees had in each filled all the intermediate parts betwixt the hives and the glasses, and were just commencing their labours in the latter. Next summer his lordship will, I anticipate, reap an extensive harvest, both from these as well as his collateral hives, which are getting into prime and excellent condition for the winter.

I have troubled you with these details, because they relate to facts, and a publication of such facts is all that is required to introduce this admirable system of bee management into universal introduction. Let the example but be extended, and the practice inculcated, amongst our rural population, and, whilst it will greatly conduce to their advantage, we need no longer look to France or Italy for a supply of treasures which our own country and peasantry could so efficiently produce. To what extension it may be brought it is impossible to state, but these results most strongly impress upon others of the nobility to go and do likewise. Nothing could possibly more advance these objects than the formation of an Apiarian Society, which should offer premiums and prizes to the most successful competitors; and I do hope that, for the sake of rational humanity, as well as philanthropy, and when I see the long list of names which dignify Mr. Nutt's list of patronage, I would fain trust that I shall not be deceived in my anticipations of the speedy formation of a society with such laudable views and objects.

I am, Sir,
Your obedient servant,
ABRAHAM BOOTH.

Reading, July 22, 1833.

THE UNDULATING RAILWAY.

Sir,—So many sturdy strikers are all hewing at once at Mr. Badnall, and he shews himself so fair and open a combatant, so entirely indisposed to make out his case by resorting to any *ruse*, that it really grieves me not to be able to take part with him; but I cannot fight against conscience—truth is above all. His arguments, in No. 513, have in no way altered my conviction as to the fallacy of his railroad. I cannot, of course, suppose that he misrepresents any of the experiments wilfully, but I incline to

think that he must have overlooked something important which would explain the matter. I cannot accept of his offer to inspect the railroad, but this can make nothing to the question at issue, inasmuch as there are sufficient other controversialists who will inspect it. It seems to me that the sagacity of Mr. Cheverton has detected the true source of the error.—"The railway, as to the horizontal line, was not long enough for the carriage to attain its uniform motion, whilst on the undulating railway the inertia was overcome almost immediately."

I have now to take Mr. Cheverton to task, for evincing something of a disposition to quibble on words instead of taking their meaning. I had injudiciously used the term "friction," to designate the opposing force tending to impede the movement of the carriage up the ascending curve. I should have used the word gravitation, and Mr. Cheverton could as easily have corrected this error, as that of my using the term "gun" instead of "generator." The quibble was scarcely worthy of him. Well, then, it is the power of gravitation which gives the momentum down the curve, and it is the power of gravitation which resists the upward ascent, and helps to consume the accumulated momentum. I agree that the "greatest pressure on the rail takes place at the centre of the undulation," *i. e.* the actual friction is greatest. But in working a steam carriage up an inclined plane, the want of sufficient friction is sometimes felt, *i. e.* the wheels slip round upon one spot, instead of mounting by their adhesion. For this reason cogs have been occasionally proposed. But if a carriage be thrust upwards by an extraneous force, as in the case of the momentum acquired by a rapid descent, the friction, caused by the tendency of the wheels to slip round from the opposing points, will prove a serious obstacle. In the ascent the endeavour is to overcome the gravitation, and in the self-moving vehicle there is a want of sufficient fulcrum experienced; in the impelled vehicle the fulcri are opposed to the progress of the vehicle. A piece of iron can be moved with less difficulty to a magnet *than from it.* Why is this? That in *the former case the* attraction is an *aiding power, in* the latter an opposing power. Why can a man walk down hill with less labour than up hill? Because the gravitation aids him in the former case, and opposes him in the latter. Will Mr. Cheverton, therefore, be good enough to substitute "gravitation" for "friction," as he did "generator" for "gun," and he will possibly be able to understand my "unwary details." His scholastic learning should readily concede something to my want of familiarity with the terms of "scientific discussion," when the probability would seem that after all we both mean the same thing, though we call it by different names. The squirt shall be a syringe, if he so wishes it, as in either case it will remain an instrument for ejecting or injecting liquids—a sort of sucking pump.

Mr. Badnall, in No. 513, says, "if the carriage press upon the horizontal line E A, with a force equal to five tons, and if C D be equal to one-fifth of the force C P, the amount of pressure upon the rails, either in the ascending or descending plane, is only four tons."

This proposition can only be true while the carriage is in motion. If its motion were to be stopped by means of blocks on the ascending or descending plane, the amount of friction, in the state of rest, would be equal to that on the horizontal line, with the difference, that instead of pressing on the rail at a right angle, the line of pressure would be an acute angle with the rail; or, as a carpenter would phrase it, instead of a simple bearing, it would become partly an end thrust. But the total amount of friction would not thereby be lessened. If the carriage were bolted to the railroad, or fixed to it by brackets, so as to retain it in its position, and the railroad were then elevated to a vertical position, still the friction would remain the same, and the end thrust would continue to bear it, though the lateral pressure might be entirely removed.

Mr. Badnall asks, "*why a level line is* preferable to a *curved* line?" I conceive it to be simply this:—

All locomotion must proceed upon the principle of levers. I would hint to Mr. Cheverton, that "by the terms of the proposition all gravitation is to be guarded against."

"I thank thee, Jew, for teaching me that word."

In the case of a carriage moving along

a level surface by horses, the horses' limbs are the levers. Put them upon ice, the fulcrum is lost, and the carriage will not move. In the case of a self-moving carriage, the wheels possess an interlocking power with the rails or road, *i.e.* they have not large fulcri in the form of cogs, but they have small ones innumerable on the opposing rough surfaces. Polish the wheels and the rails, and put oil between, there will be no fulcrum remaining, and though the wheels may turn round the carriage will not move. In the ascent of a curve the interlocking power is partially lost, both in the case of the horses and the self-moved carriage, and much of the moving power is expended unavailingly. It may be illustrated by a man walking up a slippery hill, who is said to "make two steps forward, and one back." On the level road, which is shorter than the curve, all his steps are made available alike. Thus, then, the matter stands:—

1st. As the return stroke of a pendulum is less than that which precedes it, there must consequently be a loss of part of the original power which put it in motion, and corresponding to this must be the loss of momentum on the ascent of the curve.

2d. As the arc must be greater than the chord of the arc, the difference in their relative length will be another amount of loss.

3d. Every successive fulcrum is available along the whole of the level line, and no power is wasted; whereas, up the ascending curve power is expended fruitlessly, owing to the fulcri being insecure, and this is another amount of loss.

Therefore the *level* line is preferable to the *curved* line.

I believe men of "science" are accustomed to wind up a thing of this kind with the three magic letters Q.E.D., but as I never had any education, and consequently am not cabalistic, and therefore know not what they mean, your readers, and more especially Mr. Cheverton, will excuse me.

I remain, Sir,
Very truly yours,
JUNIUS REDIVIVUS.

June 27, 1833.

[We have a letter in hand of the 10th July from Mr. Badnall, the insertion of which we must defer till our next. It is due to Mr. Badnall, however, that we should in the meanwhile insert the introductory *paragraph* of this communication:—

"Your Magazine, of the 22d ult., only reached me on the 4th inst., owing, no doubt, to some irregularity in forwarding the weekly Numbers from London. I am sorry for this delay, inasmuch as the letter of your correspondent, T—s H—d, is calculated to throw a shadow on the truth of my assertions, which I should have felt it to be my immediate duty to dispel. I shall also take this opportunity of alluding to Mr. Ham's problem, as well as to the letters of S. D., S. Y., and Junius Redivivus, considering that the appeal I was compelled to make to anonymous correspondents, in my letter of the 9th June, could only bear date from the date of its insertion in your Magazine."]

THE BILL FOR AMENDING THE PATENT LAWS.

We mentioned among our "Interim Notices" last week, that after writing the article on the Bill for amending the patent laws (after it was in type, indeed,) we had been informed that just previous to the third reading of the Bill, two or three material alterations were made in it, which did not appear in any of the printed copies of the Bill furnished to the Members of the House of Commons; and that the copy of the Bill on which our remarks were founded was that issued after the Bill was sent up from the Committee, and after it had received (as was supposed) the last finishing touch of its authors. We have now the House of Lords' copy of the Bill before us, and shall proceed to point out more particularly the alterations which have been made.

Clause Third (according to our numbering) is omitted altogether.

Clause Tenth has added to it the words "any law, statute, or usage to the contrary notwithstanding."

Clause Fifteenth, which as sent up from the Committee was hardly intelligible, is much improved in the wording, and removed to an earlier part of the Bill.

The effect of these alterations is undoubtedly to improve the Bill very much; for by the omission of the third clause (the production, we understand, of Mr. Rotch, and of two years' profound meditation!) it has been freed from its most absurd feature. So many more of our objections, however, remain untouched and several of them are of so vital a nature, that we must still contend for the propriety of its utter rejection. We refer particularly to our objections to clauses first, fourth, and fifth.

We subjoin a letter which we have received on the subject from a gentleman who has taken an active part in forward-

ing the Bill, and shall leave it to speak for itself—with this general observation, that the writer cannot be more conscientiously prepared to dispute our positions than we are to defend them.

15, New Boswell-court, Lincoln's Inn, August 1, 1833.

Sir,—If I had entertained any feelings of resentment consequent on the remarks you have from time to time made on the Letters Patent Bill, and on the promoters of that measure, they would have been removed by the candour, and the conciliatory manner, with which I have been met at the interviews I have had with you. Lamenting, as I must, that you have circulated and animadverted on the Bill *as i was*, with all its faults, instead of the Bill *as it is*, amended, I entirely acquit you of every thing but inadvertence in the promulgation of the error. I am quite convinced that, until I informed you to the contrary, you conceived you were dealing with the actual Bill. Let us hope that all those who have any influence in the success or the loss of the measure, and who have read your two last Numbers, will also read this; and then, with the exception, perhaps, of some unfavourable impressions which neither I, nor even you, may be able to efface, the question will stand fairly enough for judgment.

In the space which you are now able to afford me, and in the time I am able to spare, it is impossible to state in their proper form, and to refute in detail, the arguments, if arguments they can be called, which you have adduced against the Bill. All really vulnerable points in it were withdrawn from your critical denunciation before you were aware of the fact. The confidence through which I am in possession of the history of those vulnerable poin's forbids me to say more than that I foresaw, from the first, they must be expunged, and that I rejoice they are so. I hope it is part of your plan to give in the present Number, in full, the Bill as it now is on the table of the House of Lords. If your space have admitted of it, I am sure your candour will have prompted you to do so.*

Differing from you on every topic you have urged in opposition to Mr. Godson's Bill, I trust at future opportunities to give your readers valid reasons for that difference. At present I can do little more than request them to suspend their judgment, and to remember that one side only has been heard.

You speak slightingly of the Select Committee. You "make no account of them." Now, let me mention to you some of the gentlemen composing that Committee, *and who have attended and taken part in its proceedings*. I name them from recollection, for I have not, while I write, a list of the Committee at hand. Mr. F. Pollock, King's Counsel; Mr. M. D. Hill, lately a candidate for the office of Common Sergeant; Mr. Godson; Mr. Aglionby; Mr. E. Romilly; Mr. Jervis; Mr. Lloyd; Mr. Lynch; Mr. Phillpotts—Mr. Briggs; Mr. Brotherton; Mr. Strickland; Mr. Forster; Mr. Strutt—Sir George Cayley; Mr. Heathcoat—Sir Ronald Ferguson; Mr. R. Ferguson; Mr. Warburton; Lord Lumley; Mr. Leonard. Among these you see lawyers of the highest eminence in their profession, inventors and patentees, representatives of important manufacturing districts, and gentlemen of influence, neither lawyers, patentees, nor inventors—all independent men, and far above being open to the reproach of lending themselves to any improper purpose. The meetings of the Committee thus constructed were numerous, and numerously attended.

Here, I believe, considering the limits you have prescribed to me, I must stop for the present; requesting you, however, to give me an opportunity, should circumstances call for it, to pursue you through all your comments. This I should do without the slightest feeling of hostility; for having, though possessing very little scientific knowledge, been, with satisfaction, a pretty constant reader of your work, I have never observed you, until now, deviate into any thing bearing even the appearance of ill-nature.

Your's, &c., Archibald Rosser.

* *We see no necessity for this; we hav pointed out all the material alterations, and consider that quite sufficient.—Ed. M. M.*

HYDRAULIC PENS—NEW WRITING PAPER.

Sir,—When I sent you the design for a fountain-pen, which appeared in your last volume, I was not aware that a similar contrivance had been brought out by another individual. It afterwards appeared, however, that a Mr. Parker had patented an hydraulic pen, which I believe to be very similar in construction to my own; but of this I am not quite sure, as I am not yet acquainted with the internal arrangement of Mr. Parker's.

I have used the hydraulic pen, which appears to answer extremely well: several of my friends, who have also used them for a considerable period of time, speak very highly in their favour, and agree in stating that they do not discover the least tendency to clog, as predicted by Junius Redivivus, *vide* page 122 of your 18th volume.

I have now the pleasure of informing

this gentleman, and your readers generally, that a new writing paper has just been introduced, which, by means of a chemical preparation which it undergoes, has the singular property of becoming perfectly black whenever it is touched with a fluid. It is only necessary, therefore, to write on this paper with a pen dipped in clean water, to produce as distinct and legible a communication as that now before you. The substitution of a clean dilute fluid for a thick and dirty one—either with quill or metal pens—is a change in every respect convenient. To travellers, short-hand writers, and others, this invention is invaluable, as water is almost every where attainable; although, upon an emergency, wetting the pen in the mouth will be sufficient to produce the desired effect.

The introduction of this paper will go far to supersede the use of fountain-pens of all kinds; or, at any rate, clean water alone need be carried. The paper will be supplied in convenient sizes for letters, &c., and also made up into books of various appropriate forms for the pocket.

Yours respectfully,

W. BADDELEY.

July 23, 1833.

LORD EBRINGTON'S BILL—WEIGHTS AND MEASURES.

Sir,—Should Lord Ebrington's bill be enacted, as it is reported, the informers will be very much indebted to his Lordship.

By the 38th George III. the following staple articles of merchandise are bought, sold, and accounted by, *not* 112, but 100 pounds weight:—cotton, wool, silk—the staple articles of manufacture. Next, tobacco, spices, drugs, indigo, &c. The East India Company employ the Chinese weights, in the exact ratio to the English as 3 is to 4. Therefore, tea is also bought, sold, and accounted, per *not* 112, but 100 pounds weight. Lord Ebrington's bill declares that those commercial exchanges are illegal; and that for every transaction included in those commercial exchanges there shall be a penalty imposed of 5*l.*—because the Irish weight which is called, or rather miscalled, a *stone*, of 14 pounds, " is a very convenient multiple" to—the *abolished* Winchester bushel of 56 pounds of wheat!

In Liverpool, Manchester, Glasgow, and throughout Ireland, corn is sold by weight. This practice, which is allowedly correct, Lord Ebrington's bill declares to *be illegal!* Mr. Vernon, who will this day bring in a bill to enact that corn shall be bought and sold throughout the United Kingdom by weight, is of the directly opposite opinion. There are 5 bushels of wheat, Winchester measure, to the Irish imaginary barrel; therefore, there are 280 pounds to the English sack of flour.

Then, the English butchers are also to be fined for purchasing meat by 8 pounds —because the Irish stone of 14 pounds " is a very convenient multiple" to the *abolished* Winchester bushel of 56 pounds of wheat!

Sugar is bought and sold in the English colonies of Jamaica and Trinidad by the Spanish wholesale weight of 100 pounds English. Cotton, tobacco, rice, &c., are bought and sold in the United States, for the English market, by the Spanish wholesale weight of 100 pounds English. Mr. Jefferson considered the Isthmus of Darien the natural boundary of the United States; and that great and virtuous man also considered that measures are more lasting than men, in adopting the Mexican dollar.

The United States having adopted the East Indian, Portuguese, and Spanish measures, Lord Ebrington's bill proposes for Ireland and Scotland those land-measures which are being abolished by the United States!

There were 6,948,205 imperial gallons of proof spirits consumed in the United Kingdom during the quarter which ended the 5th of April last. There were 6,628,496 imperial gallons of wines imported in the year 1830. Is the error in the measure of capacity, which is referred to in this Journal of the 22d of last month, to be perpetuated to the injustice of the revenue?

Mr. Vernon's bill will effect what Lord Ebrington really intended. I make no doubt you will endeavour to defend the traders of the United Kingdom from the penalties of Lord Ebrington's bill.

I am, Sir,

Your very obedient servant,

T.

July 30.

SOUTHWARK LITERARY SOCIETY.

Sir,—Perceiving among your "Interim Notices," in a recent Number, one relating to the Southwark Mechanics' Institution, I write this, with much regret, to inform you, that the Institution has ceased to

exist. It became extinct, if I remember correctly, at about the end of 1829. Whether the cause of its decline was its not being sufficiently adapted to the wants of mechanics, or whether they were indifferent to its success, is a question which I am not competent to decide; this, however, I do know, that its decay caused much sorrow to many individuals connected with it, and that they did not take any steps for breaking it up until they had convincing proof of the apathy with which the Institution was regarded in the neighbourhood.

Having so far spoken of the failure of one Institution in Southwark, I feel much pleasure in being able to state that, lately, the inhabitants of the Borough and its vicinity have fully evinced their love for literature and science, by the spirited manner in which they have supported the "Southwark Literary Society." This Society, which was established about fourteen months ago, for the advancement of literature, science, and the arts, consisted at first of but very few individuals; it now boasts of more than 200 members. The library contains about 2,000 volumes, comprising some of the most standard works in literature and science. A museum of natural and artificial curiosities is in progress, and, considering the short time the Society has been established, it displays a very good collection of specimens. Two courses of lectures have been already given to the members; one on Phrenology, by Mr. Holm, the other on Jacotot's System of Education, by Mr. Payne. The reading-room, which is supplied with Morning and Evening Papers, Magazines, Reviews, and other periodicals, is open from nine in the morning till ten at night.

The Society has recently moved into commodious apartments, situate in Bridge House Place, Newington Causeway.

The new lecture-room was opened on the 10th inst., when the President, J. P. Thomas, Esq., &c. &c., delivered a highly interesting address on "Knowledge the Fountain of Happiness," to a numerous and respectable audience. Dr. Birkbeck attended on the occasion, and expressed himself to be much gratified at the success of the Society. It is intended that lectures on popular branches of literature and science shall be delivered weekly during the winter season.

Independently of the Society's library, the members have the privilege of using the President's library, consisting of nearly 2,000 volumes; that gentleman having, with much liberality, thrown it open for their use.

Yours, &c., PIT.

July 23, 1833.

Percussion Locks are likely to be used in the French service, on account of the favourable impression made by various experiments with them in the Hanoverian army. These experiments, it seems, were tried when the weather was very rainy, in order that the effect might be ascertained under circumstances the most unfavourable that can arise in the course of a campaign. Out of 340 muskets with percussion locks, consuming together 27,000 cartridges, there were only 21 that missed fire from the priming, and 72 from defect in the charge, making in all 93. While out of the same number of muskets with flint locks, burning the same quantity of cartridges, 1,448 missed fire from the priming, and 378 from the charge, making together 1,826. Still farther tests were employed, both in exposing the muskets to a constant rain, by wetting the inside of the cap, and by putting a drop of water into the touch-hole. The result was that the percussion guns, after being exposed to the injuries of the weather, or even a constant rain, were greatly more to be relied upon than those with flint locks.—*United Kingdom*, July 21, 1833.

Birmingham Railway.—A correspondent of good authority informs us, that the description of the line of this railway given in our Journal of the 13th of July is, in several respects, incorrect; and that the following is the true line, as determined by the Act of Parliament:—It commences at the Regent's Canal between the Regent's Park and Hampstead Road, and passes through a tunnel under the north side of Primrose Hill; its course then is to Kilburn Wells, approaching the Grand Junction Canal at Kensal Green and Holsden Green for two or three miles, when leaving the line of the Canal it turns to the north, along the east side of Harrow, as far as Watford; leaving Watford on the west, it again approaches the Grand Junction Canal near Hunton Bridge, following the course of the Canal for many miles up the Vale of Bulborne—*not that of Gaddesdon*—when passing Tring, Leighton Buzzard, Fenny Stratford, Stoney Stratford, and Daventry—a few miles beyond the latter place, its course is across the open country to Coventry and Birmingham.

Remedy against the Impositions of Hackney-Coachmen, Cab-Drivers, and Watermen.—Let a clause be inserted in the existing Act of Parliament compelling the owners of all hired vehicles to carry in a side-pocket of each of them a printed list of the different fares as settled by the Legislature, so that any person may avail himself of it to obtain correct information as to precise charges; which will thereby prevent, in the most complete and satisfactory manner, all attempts at imposition on the part of these, generally speaking, "scoundrels," as Swift termed them 100 years ago. Watermen, in the same manner, to have a little box, containing the various legal rates on the River Thames. "Black and white," as Cobbett says, "tell no lies," at least in this case would not.—ENORT.

INTERIM NOTICES.

The crowd at our *Conversazione* on Wednesday was so great, and the *sederunt* extended to so late an hour, that we are obliged, from want of room, to defer the insertion of the report till next week.

"A Constant Reader" should address his application to Arthur Aiken, Esq., Secretary of the Society of Arts, Society House, Adelphi.

Communications have been received from Australiensis.—S. Y.—Mr. Wilson.—Mr. Rutter—R.—Mr. Waldron—Mr. Thompson.

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Mechanics' Magazine,

MUSEUM, REGISTER, JOURNAL, AND GAZETTE.

No. 522.] SATURDAY, AUGUST 10, 1833. Price 3*d*.

DESIGN FOR A STEAM-DRAG.

Fig. 1.

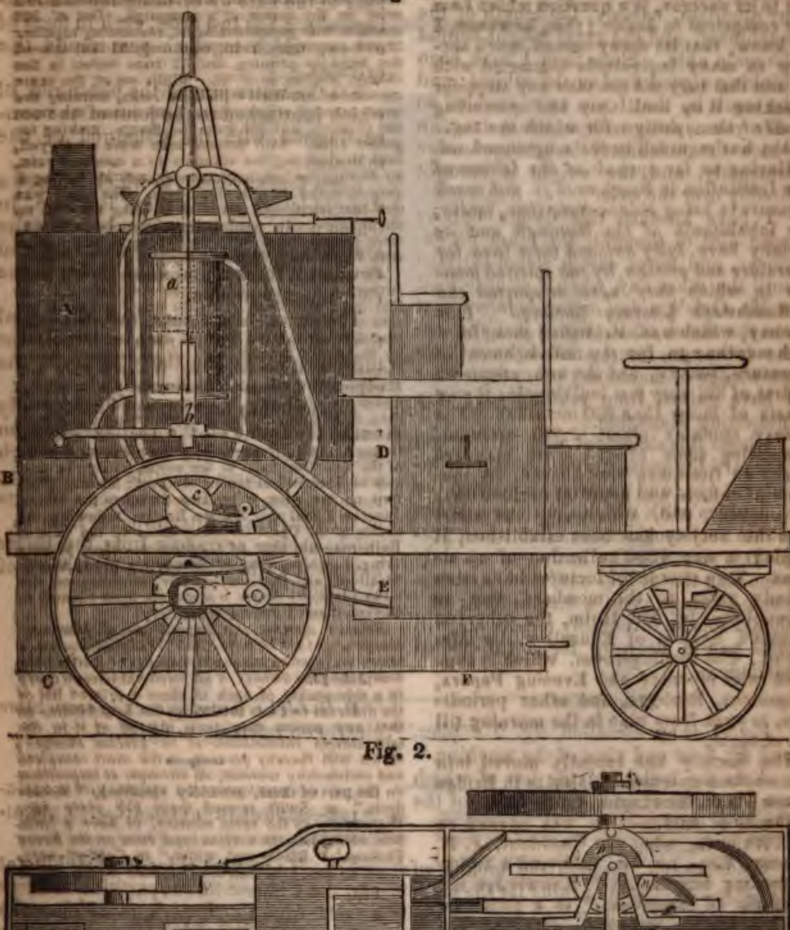


Fig. 2.

DESIGN FOR A STEAM-DRAG.

Sir,—When I saw Mr. Ogle's steam-carriage, two things particularly attracted my attention, namely, the length of the machinery, and the great weight behind the main axle. Since then I have been thinking a good deal on the subject; and the result is, that I am now enabled to offer you a design for a steam-drag, in which the machinery is arranged more compactly, and the weight is brought directly over the axle.

I have knocked this design out by mere dint of thought, for I am no engineer, and never saw a steam-carriage until the other day, when I went to look at Mr. Ogle's, a day or two before I sent you the sketch of it, which you did me the favour to insert; and I have little knowledge of machinery other than what I have gained from reading your very interesting Magazine.

I hope this statement will induce you to regard the present attempt with an indulgent eye, and more especially as the difficulties with which the subject is beset are very considerable. But I now proceed to describe the arrangement, only premising that it is as easily adapted to a steam-carriage as to a steam-drag; and should this be favourably received, I will send you a drawing for a full-bodied carriage.

Description.

Fig. 1 is an elevation, fig. 2 a plan, and fig. 3 an end view of the machine.

A is the boiler, on the top of which are the chimney and mouth-piece for the supply of fuel.

B the furnace.

C the ash-pit, through the middle of which is an octagon opening for the main axle to pass through, which must be defended from the heat of the fire by a thick iron shield above, which may act also as a bearing for the bars.

D is the water-cistern, kept down to have the weight as near the ground as possible.

E the condenser.

F a passage from the ash-pit, open in front, to supply the furnace with air, on the supposition that the draft produced by the rapid motion of the carriage would be sufficient for that purpose. The fore part of the carriage requires no particular description: there is a seat for the guide, and above D one for two engineers, the man who supplies fuel and stops the carriage, and for the stoker.

aa are the steam cylinders, brought near to the axle by dividing the connecting-rod; it has two arms, each in form of a bow, which together pass round the cylinder.

b is the water-pump, the piston-rod of which is attached to the joint of the connecting-rod with the piston-rod of the cylinder.

c is a fourway-cock, to which is fixed a straight lever; in this there is a loop, in which a pin projecting from between the arms of the connecting-rod works up and down as it turns round, thus giving to the cock a rotary motion.

The steam-pipe comes from the top of the boiler, where is seen a handle for turning it off or on: the intention of the other pipes is also sufficiently clear.

The axle has four springs immediately under the frame of the carriage, one on each side of both the cranks, for which purpose the frame is double in that part; running along by the furnace, and also at the distance of fifteen inches from it.

The spokes are away from the upper half of the wheel, to give a clear view of the machinery.

I am, Sir,
Your obedient servant,
S. D.

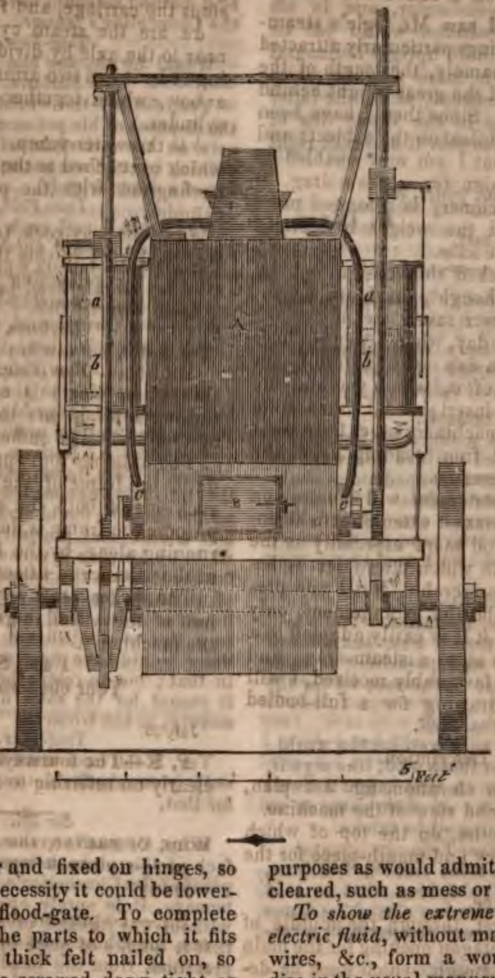
July 30.

P. S.—The fourway-cock is seen more clearly on referring to fig. 3.

MODE OF PREVENTING SHIPS FROM SINKING—SINGULAR ELECTRICAL EXPERIMENT.

Sir,—To prevent ships from sinking at sea, the Chinese fix one partition at about a third from the head, and another the same distance from the stern; but as this plan would not do for our navy, I have made the following alteration in it, which I conceive would make it applicable for that purpose:—There are at present magazines and compartments in the holds of our ships of war. I would arrange as many of the sides of these as possible in the above direction, which sides should be built up with timber and caulked tight. Now, to fill up the remaining space, which must be left for circulation of the air and communication with the different parts of the ship, a corresponding portion of the deck above it might be

Fi 3.



framed together and fixed on hinges, so that in case of necessity it could be lowered down as a flood-gate. To complete the partition, the parts to which it fits should have a thick felt nailed on, so that it could be screwed down tight as quickly as possible. By this means, if a ship should spring such a leak as the pumps could not gain upon, the deck could be let down, which would confine the water to one part of the ship. For in a gale of wind it is the motion of the water in the hold that causes her to go down much sooner than she would do from the mere weight or quantity of it. But as ships are more likely to receive an injury in the stem than the stern, probably one would be thought sufficient. Of course, those *parts in the way of the moveable deck must be* used for such purposes as would admit of being quickly cleared, such as mess or sleeping rooms.

To show the extreme velocity of the electric fluid, without making use of long wires, &c., form a word on a resinous disc in the usual manner by pieces of tinfoil. Then fix it in a lathe, and revolve it rapidly, so that nothing whatever can be seen but a series of circles. Under these circumstances, it would seem impossible for any one who did not know what word it was to read it; but if the charge of a Leyden jar be sent through it, the word will appear perfectly legible, and remain so for a short time, though during this time the disc must have made several revolutions. Or if a torrent of sparks from a powerful plate machine were passed through it, the paradoxical appearance would be seen of a word

which, though sometimes *topsy turvy*, at other times perpendicular, and in all other possible positions, would yet be continually seen in an upright horizontal direction. This is more singular than Dr. Paris's thaumatrope, as in the latter the object moves in the direct line of vision, but in the former it moves at right angles to it.

I remain, yours, &c.,

G. DAKIN.

Dereham, June 20, 1832.

PETERBOROUGH-COURT CONVERSAZIONE.

July 21, 1832.

PRESENT.—*Ordinary company.—Visitors extraordinary: Captain Leechem, Solomon Secundus, and Mr. Profile.*

Crackwell.

You played us a fine trick last month, Mr. Editor. I had no idea you were serious in the hint you dropped about shewing us up to your readers. I have been confoundedly quizzed ever since about one or two things your reporter laid to my charge. Had I known I would have been more cautious.

Editor.

Better as it was, Professor. The world is getting wiser than it was, and likes to see its teachers and preachers in their working garments, not primed up for the nonce.

Crackwell.

Aye, that's all very well for the world; but not so well for those who, like myself, have to live by it. A man might as well expect to grow fat on flint soup as to thrive by publishing all he thinks.

Tout-Voix.

Crackwell has some reason, I believe, to fear that your publishing what he said about the Chancellor has played the deuce with his reversionary prospects in a certain professorship.

Barbette.

Let the Professor be consoled. If he is disposed to barter his opinions for bread and cheese—

Crackwell.

Barter opinions, Major! No, no; I meant only to hint, that if a man would not altogether forget his own interest he must sometimes keep his opinions to himself.

Barbette.

Well—you would barter your silence, as Toady Professor, which I take to be much the same thing.

Testall.

And quite as safe a commodity.

Barbette.

I was going to say, that if the Professor *be so disposed*, and will but shew teeth

enough, he has certainly hit upon the best method he could have taken to secure the Chancellor's favour.

Barbette.

Yes; the Chancellor acts on the same principle as Napoleon, who [illegible]

Barbette.

Yes, for it is the world's notion, that in the disposal of his patronage, his lordship acts on the principle of preferring the gaining over of one enemy, to the rewarding of a dozen friends.

Tout-Voix.

Now, that I call rank scandal. Why, Major, you cannot surely have read the admirable sentiments which his lordship expressed on this head in his speech on the Local Courts' Bill.

Barbette.

Yes, I did, but saw nothing in them.

Tout-Voix.

What! nothing in the fact that he has left the vacant judgeship in the Court of Bankruptcy so long unfilled?

Barbette.

Pooh! 'Tis, to my mind, the very fact that tells most against him. Were he to fill up the place he could make or reward but one friend, and mortally offend many; while by keeping it vacant, he can reckon for the time on the support or neutrality of, perhaps, hundreds, who have set their hopes upon it. Had he at once brought in a Bill to abolish the office as useless, there would have been sense and honesty in that; but to retain the office, and keep it vacant for the sake of the temptation merely, is sad trickery.

Tout-Voix.

Yes, if the case were so; but we have only your charitable conjecture, Major, for that.

Sir Di.

Why, Counsellor, since you adduce the fact of this place being left vacant as a proof of the Chancellor's disregard of patronage, it is surely open to the Major, without any breach of charity, to show that it admits of quite an opposite interpretation.

Crucible.

The more especially considering how much the fact was relied on by the Chancellor himself.

Testall.

Whether the Major be right or wrong in the sinister policy he ascribes to the Chancellor, there is no denying that, as a point of fact the keeping of the office vacant must tell much better in the way of influence than if it were filled up.

Sir Di.

And as little to be denied that the general tenor of Brougham's conduct as a public man, his fatal [illegible] on most topics, and the [illegible] ness for playing first fiddle which is a

the bottom of all this—are greatly in favour of the Major's interpretation.

Barbette.

Yes; the Chancellor has the same propensity as Napoleon had: he can abide no one who is more skilful or influential than himself. Well he understands, how to

Condemn, for arts that caused himself to rise;
Damn with faint praise.

Tangent.

He was not always thus: 'tis your confounded politics that have spoiled him. Had he stuck to his mathematics he might have established for himself a name as spotless as pre-eminent. There was once true nobility of spirit in him.

A slight rustling is heard in an obscure corner of the room, from whence issues in a solemn tone the word—

NEVER!!!

All start up, and turn their eyes to the spot, which appears filled with clouds of vapour, in the midst of which is seen a human figure, with a black mask, and a mantle drawn closely around it.

Crickwell.

Mr. Editor, is this another trick you are playing us?

Editor.

No trick of mine. Perhaps Crucible can explain.

Barbette.

Let our mysterious visitor explain himself. Who the deuce are you?

The figure advances a step, and replies—

JUNIUS!

Barbette.

Indeed! The old or the new of that name?

Figure.

The new.

Solomon Secundus.

What! my once antagonist, Junius Redivivus!

Profile. (Aside.)

And brother pretender.

Editor.

My right trusty and well-beloved ally! A thousand welcomes! You see none but friends here, so do pray cease your masquerading, and let us converse with you for a while face to face.

Junius.

Were I to drop my mask, you would be none the wiser.

Sir Di.

Why then not drop it? Who, but from necessity, would muffle up his face in hot weather like this?

Junius.

Sir Dionysius Dewydeker, you speak reason, and to reason I am ever ready to yield. [*Drops his mask.*]

Profile (taking out his sketch-book, and eying Junius keenly).

'Tis just as I conjectured—good common sense predominant—the organ of circumstance also well marked; but forehead narrow—vision limited. No great things after all.

Sir Di.

'Tis a face that puzzles me exceedingly. It contains something of almost every body and every thing. 'Tis a poet's, politician's, philosopher's, soldier's, citizen's, mechanic's, man of the world's face all in one. Now it puts me in mind of Wilson, now of Cobbett, now of Waterton, now of Harriet Martineau, now of Rammohun Roy; and then 'tis like none of all these, but something wholly different.

Testall.

A shot-silk sort of face, Sir Di.

Captain Loochoo.

Gentlemen, I have been examining him carefully through my celebrated camera lucida, and I am satisfied that he is no other than that low American fellow called Doubikins, who annoyed me so sadly in the Union by what he called his plain common sense. I did hear, some time ago, that he was over here in disguise; but I had no idea of detecting him under such a mask. A Kentucky wood-chopper to pretend to be Junius Redivivus! Was ever there such presumption? I wish I had him in the frigate I am to have for writing down Jonathan, when the Tories get into power again. Only let me have him in blue water.

Sir Di.

I suspect, Captain, that this is of kin to most of your other notable discoveries—the spotless innocence of the Loochooans, for example! and the noble-minded patriotism of Charles the Tenth.

Editor.

No politics, Gentlemen.

Junius.

"No politics!" If by politics, Mr. Editor, you mean what has hitherto passed by the name, you are right; for hitherto it has been a mere game of faction, than which nothing can well be more base and worthless. But the time has come for a change: the cup of bitterness runs over; and the shrill cry of reform pierces the innermost penetralia of the adept and the student alike. The hearts of all the just and good are bent on a lasting change, that shall work for the happiness of the many, and not for the ambition of the few.

Captain Loochoo.

"Oh, the father! how he holds his countenance."

Junius.

Aye; thus it ever is with your mere worldly men. Having no sincerity themselves, they cannot believe that sincerity exists. Poor, groveling worms; they bury themselves in dung-heaps, and know not the joy of looking on white-robed, beautiful Truth.

Solomon Secundus.

That's very fine, Junius, but what say you to the consistency of your white-robed lady having a knight in mortcloth, and with vizor down, for her champion? It puts one in mind of Campbell's cart-before-the-horse simile, in *Gertrude of Wyoming*, of "morning led by night."

Junius.

Word-catcher, avaunt! I speak from the heart, and to the heart—not to lip-service men like thee. I grieve over the degeneracy of the mass of those amongst whom I dwell; and my spirit at times teaches my tongue the words of bitterness, but never of frivolity. Would that I had the voice of a prophet of the olden time! Oh! for words of fire, that might stir men up to be what they should be, to win imperishable fame by the acts of gods!

Crackwell. (Aside.)

Gods! how he talks! "He doth it like one of those harlotry players as ever I see."

Editor.

Junius, we were talking of Brougham when you broke in upon us.

Junius.

Yes; some of you said there was *once* true nobility in him. Now, to that I reply again, Never! never! Had there been any true nobility in his nature, he could not have so wantonly flung away the proudest source of deathless fame that ever yet offered itself to clip and render immortal the perishable name of any unit of the great human family. Light there was once in the eye of Henry Brougham; but it was a deceitful flicker, that glistened only to blind. He might have reaped endless glory; and he has committed, instead, suicide upon his reputation. He might have lightened up the hearts and brains of all the working men in Britain; and, for selfish purposes, he has abandoned them to neglect and ignorance.

Tangent.

Might not Brougham err more through vanity than through design?

Junius.

He has vanity enough to make ten men err; but he is too cunning withal to permit one to think his errors were otherwise than designed. He would have been willing *partially* to instruct the people; but he knew not how to set about it, and so has done nothing. Even the "Diffusion" was planned by a lawyer, who intended it for something better, but Brougham spoiled it.

Editor.

No, not by a lawyer, but by that clever book-maker, Sir Richard Phillips, who sought the co-operation of Doctor Birkbeck, who applied to Brougham to join, who, liking the scheme but disliking the originator, forthwith started it as his own.

Sir Di.

Just as he behaved with respect to the London University, which he was invited by the Dissenters to assist in establishing, and then contrived to bring out as another of his own splendid plans for the good of mankind.

Editor.

Yes, the history of that other juggle you will find very faithfully given in our Journal of the 22d August, 1829. The relator was himself one of the betrayed parties—and, I may here add, one of the most honourable and worthy men of his time.

Testall.

You said, Mr. Editor, that it was Birkbeck who communicated the scheme at second-hand to Brougham. If so, this may account for his never having been a member of the Diffusion Society—on the Committee of Superintendence, at least—a circumstance which I have often wondered at.

Editor.

Yes, it does; and it is a fact highly honourable to the Doctor. I have understood that he steadily refused to be any party to the sort of pious fraud practised by his friend on the occasion.

Junius.

What Brougham should have done, if the good of the people, apart from the gratification of his own ambitious vanity, had been his object, was to procure the appointment of a Minister of Public Instruction, with responsible duties, as is the case in most Continental states. He could have done this easily when he came into power. He knew of fitting men, too, for the office, but loathed the notion of giving the staff out of his own hands. As it is, after all his boasting about taking and keeping office for the sake of furthering the cause of the people, he has merely served to throw back the tide of improvement all in his power.

Editor.

I cannot agree with Junius as to the propriety of appointing a Minister of Public Instruction. 'Tis a large subject to enter upon, but I may say briefly that, in my opinion, the less Governments have to

ith forming the minds of the people etter.

Junius.

t me be not misunderstood. I mean y that there should be a Minister of c Instruction to see everywhere pro- the means of learning every thing; ot that he should have the power of g what should and what should not ught. We will discuss this, however, i please, at another time. You, Mr. or, are no doubt of the opinion, that est possible public instructors are the c journals; and there is no doubt that for one, wield an instrument of con- able power in your Magazine. I seen good indications in it: follow up, and let the *Mechanics' Magazine* far as possible a Minister of Public action to the people of England. e you are about it, however, you d do well to keep your friend Bar- there from expressing such hasty ons as he did last month about he.

Editor.

w?

Junius.

y, he said he was *only* a poet, ro- er, moralist, and metaphysician! t, in the name of all the sciences, you expect more out of an indi- l brain? *Only!*

Barbette.

sed the word *only* in reference to the ty, not the quantity of his attain- s; for I hold that the world could bet- are such knowledge as Goethe pos- d than it could the sciences, which the staple of such works as the *anics' Magazine.*

Junius.

eems to me that you "exact science" , as you call yourselves, are just as d one way as poets—not true poets, are ever very perfect men—but as in ordinary, romancers, moralists, metaphysicians, are on the other side. exact people are all for the *utile*, their sites are all for the *dulce*. It never s to strike the one party, that useful s are all the better for being made able; nor the other party, that agree things are all the better for being ined with the useful. "What can prove?" asks he of physical science. ll your proof add to human happi- ?" retorts his antagonist. "If it will it is useless." Take the good that all things, is the dictate of true sophy.

Sir Di.

ere is reason in his remarks, though evil had spoken them.

Solomon Secundus.

I am glad to perceive that the *only* fault Junius has to find with your last month's talk respects what was said of Goethe. I was fearful at first that he meant to give Testall a rap over the knuckles for his estimate of German science. I happened to be absent from the last *Conversazione*, but had I been there I should have joined most heartily in giving the *coup de grace* to the pretensions of the Germans to scientific knowledge. How laughable it would have been to shew the striking contrast between Germany and the rest of Europe, by throwing in the name of one of their unknown ignoramuses after each of those really great modern philosophers you talked of. How ridiculous in such juxta-position would have sounded the names of KEPLER and LEIBNITZ, and EULER and WERNER, and HERSCHEL and MITSCHERLISCH! The very mention of such names, in the way of rivalry to the Newtons and Davys, must have thrown you all into fits of uncontrollable laughter.

Editor.

Mightily ironical, as usual, friend Solomon; but, permit me to say, not so correct. The great names mentioned at our last meeting were *not* cited with the view of shewing any contrast between Germany and the rest of Europe, but in order to shew that modern times have not been so deficient in point of scientific discovery, compared with the times preceding Roger Bacon, as Goethe alleged.

Testall.

In fact the additional names mentioned by Solomon, all of which belong to times long subsequent to those of the Friar, only serve to manifest more clearly the prodigiousness of Goethe's ignorance of the discoveries of the moderns. He did not even know what his own countrymen had achieved.

Sol. Sec.

Well it must, at all events, be allowed that the entire omission of Germans from the list of illustrious moderns, chimed in admirably with the disdain afterwards expressed for the scientific attainments of the Germans in general! The more especially, considering that the barbarians have hundreds of would-be-philosophers even more ignorant and obscure than the Keplers and others I have mentioned!

Testall.

It is not even hundreds of Keplers or Werners that will make a scientific nation; and it was of the German people in the general that I spoke, as compared with our own.

Sol. Sec.

True, and you cited a school-book of that celebrated philosopher, Wilhelm Von Turk, in proof of your position. Need I say how properly? Surely, if such a book, by such a man, can be proved defective, the game is up—the whole nation must be at once acknowledged idiots! How could we English hold up our heads if the Germans were able to muster up science enough to prove the incorrectness of our great Von Pinnock's "Guide to Knowledge?" How ridiculous to claim some knowledge of chemistry on the part of Davy, Wollaston, or any of our countrymen, after the renowned Accum had himself been found wanting! The thing is settled—Von Turk is a superficial quack—*ergo*, all the countrymen of Encke and Mitscherlich are profoundly ignorant!

Tangent.

Q. E. D.

Sir Di.

Which translated into the vulgar tongue means, I suppose—which is devilish nonsense.

Sol. Sec.

Mark, besides, the monstrous absurdity of judging of Germany by the eminent men—hundreds though they be—whom it has produced. It is almost as absurd as judging of a tree from its fruits. If the Germans, speaking of them in the general, as Testall says, had ever any science in them, they never could have contributed so little to the circle of the arts as they have done. Their poverty of invention is too old a story to need any new illustration. Every body knows that they never made any discovery of higher consequence than the art of printing. I really wonder you all took so much mercy on them on this score. Surely, Mr. Speed, *you* might have volunteered a sneer or two more at their jog-trot progress in mechanical skill; and Mr. Editor would have backed you if he had happened to recollect that the steam press which gave your last *Conversazione* to the world, but took an entire day for the purpose, at a rate of no more than two thousand per hour, was the invention of a heavy-headed German of the present century. What a half-learned ninny must Könitz have been! How destitute of practical science the country which produced him!

Crackwell.

Solomon, you're a wag.

Sol. Sec.

Perhaps; but not half so mad a wag as your friend Babbage, who, in his "Decline of Science," has done worse by the Germans than even the most professed enemy could have done, by gravely pretending to eulogise their "splendid discoveries," and affecting to point out branches of research in which they are more advanced than even our own countrymen!

Editor.

You allude, I presume, in particular, to what he says of Mitscherlich and the laws of isomorphism?

Sol. Sec.

Yes, those laws of which our philosophers are pronounced by Babbage, and also by Herschel, another mad wag, to be deplorably ignorant, in comparison with their pretended discoverer!

Profile.

I think Testall must confess now, that it was rather a caricature portraiture he gave of the Germans.

Sol. Sec.

Stop, before you put the man to confession, let me mention one other thing I have forgot, and that is to advert to their achievements in the fine as well as the useful arts. What fun you might have made of them here! Only think of a country pretending to musical taste, which can point to no higher names than Handel, Haydn, and Mozart, in the last century, and to Beethoven and Von Weber in this! Only think of a people pretending to graphic skill, whose greatest boast in this way is to have produced the art of lithography!

Crackwell.

Solomon, I say again, you're a wag.

Barbette.

Not such a mere word-catcher after all, Junius?

Junius.

No; "a second Daniel (not Solomon) come to judgment."

Sir Di.

How do you feel, Testall? You are silent.

Testall.

I am breathless from the excessive heat. Do pray, Mr. Editor, order the windows to be thrown open. The thermometer must be 100 at least.

Sol. Sec.

By whose scale do you reckon, Testall?

Testall.

Fahrenheit's.

Sol. Sec.

Another ignorant German, by all that is comical! Another unanswerable proof of the low state of practical science among this dreaming people—

Here Testall shews symptoms of fainting, but is recovered, after a short time, by a plentiful sprinkling of a certain distilled water of great fame in such cases.

Testall.

w refreshing! What is it?

Editor.

de Cologne.

Testall.

! Oh! German too. I—I—

nts clean away; great confusion; recovers at last; but carriage ordered, and exit Testall.

Sir Di.

ur raillery, Solomon, has quite up-r friend Testall; but, after all, you still left untouched the main point was in discussion at our last meeting, xtreme ignorance of Goethe in re-to the discoveries of the moderns.

Sol. Sec.

is a charge which rests entirely on earsay of Müller, who probably ok some sportive effusion of Goethe's deliberate judgment on the matter. carcely necessary to peruse his works tics and botany to be satisfied that s as well-informed, if not profound, ence as in most other matters.

Editor.

s not improbable, certainly; so let emory have the benefit of the more able inference.

Junius.

this shews still more clearly the priety of sweeping, one-sided con-ns, whether of men or things. I that the dictate of true philosophy take the good that is in all things, uld have added, and that is in all and tongues. But we will return, please, to my more immediate pur-which was to recommend a closer of the *dulce* with the *utile* in all our its, and this to our editorial friend n particular.

Editor.

plain! What would you have me

Junius.

ould have you do for the great mass working mechanics of Britain that Henry Brougham has failed to do make of your Magazine a text-of moral as well as physical instruc-to set forth the causes of human y, and to point out the paths to hu-happiness; to work a change in the n, beginning not as of old from e, but working upwards from below. been said that the aristocracy have to been the civilisers of the people: se the tables, and now make the e the civilisers of the aristocracy. that nature makes nobles, and thus improvement on the nobles of art, e dread of being pushed from their s.

Captain Loochoo.

Why the fellow is a downright leveller.

Junius.

I am a leveller, but it is a leveller up-wards; not degrading the rich to the pre-sent level of the poor, but raising the poor to the level of the rich.

Captain Loochoo.

And do you really dream that there can ever exist such a thing as human equality?

Junius.

Not intellectual equality, and, con-sequently, not equality of station; but moral equality may exist. Every human being, high or low, may, for instance, be alike convinced, that any injury inflicted on a neighbour must be ultimately pre-judicial to his own interests.

Captain Loochoo.

Perhaps so, with the aid of a little wholesome chastisement—such things as bolts and bars—occasionally.

Junius.

Such is ever the argument of tyrants. You learnt that on the quarter-deck.

Sir Di. (Aside.)

And promulgated it in the "Quarterly Review."

Junius.

But know, Captain, that the reign of *prestige* is departing. Out of the ranks of the mechanics—the working mechanics—will arise a power of passion, knowledge, intellect, and judgment, combined, which will startle the hollow hearts of those who have so long deceived them for the pur-pose of holding them in submission. A glorious stride forwards will be made. The physical science needful to many trades, and misery combined, have taught them to think, and they will not think fruitlessly. They will be more powerful than the middle classes, for they have nothing to unlearn, and, consequently, have nothing to retard their progress. The middle classes, who, alas! may in many cases be called the *middling* classes, abound in the absurd prejudices of "re-spectability" and ostentation. They lackey the manners of the great, and lack the masculine understanding which strips a subject at once to its pith, and grapples with it. The men of hard hands will be found to possess hard brains, when once they are put to it. They will not be re-strained by words, but will combat them with ideas and opinions, boldly advocated. It will not be in the power of either the sharp tongue or the glancing bayonet to persuade them that stones are bread.

Captain Loochoo.

You talk this well, but I suppose you are paid for it. (*Aside.*) I am for all I

write; and no man would be fool enough to write for nothing.) But where do you find the samples of the intelligent mechanics you speak of?

Junius.

False Scot! Is Elliot, of Sheffield, nothing? He whose words are sharp and cutting as his own steel? He whose fire of passion glows and scintillates like a mass of welding iron. Think you that his words have not entered into the hearts of hundreds of thousands, and traced, as with caustic, the words, "No corn-laws?" Think you that the men of Sheffield will be slack to do his bidding, when he shall bid them peal their voices for the repeal of mischievous taxes? Is Samuel Downing nothing, even though he be reduced to earn his bread by the sweat of his brow; even though his powers have been shorn of half their development by stern necessity, which has strengthened his character while it has cramped its workings? Have you marked his varied powers; have you watched how his mind ranges from the minutiæ of art to the extremes of science, from the improved construction of a dome up to modelling of the mind of man? Have you marked how in him passion, and deep feeling, and the love of beauty, and the reverence for noble things, the perception of truth, and the possession of judgment, and the power of withering sarcasm, are all duly mingled; and can you doubt that such were the qualities which gave to the patriot Milton his glorious powers? By Heavens! the blood ripples through the half-stagnant veins, and the heart swells and pants high in hope, while thinking of these things. A mechanic, friendless and unknown, working fourteen hours a day, whose hand is familiar with the details of joinery and marquetry, and the delicate tracery of buhl-work, a cunning artist in iron and brass, and hard and soft wood, for the fabrication of those things which Luxury would rather lose her ears than exist without—this mechanic is found to possess the same mastery over mind as over matter; this mechanic is found to possess as refined and delicate sentiments as the wealthiest in the land, cradled in the lap of luxury. Oh! but there is hope for England, while such beings are found amongst her working men.

Crackwell.

The man really speaks as though he believed what he says.

Captain Loochoo.—(Aside.)

I think I'd go on the same tack—if I could get any thing substantial by it.

Barbette.

But, after all, this is mere declamation. You have cited two men of abilities, but they make nothing to the great mass of the mechanics. They are exceptions to the rule.

Junius.

Away! unbelieving soldier. I tell you they are but the outward indications of that which is within. Numerous are the lofty spirits lying beneath the surface, amidst the skilled labourers of the community. They are at present crushed by circumstances; but if other circumstances shall call them forth, the world will rub its eyes, and say, "How happened it that we knew not of this?"

Barbette.

It is somewhat strange that more of them do not show themselves.

Junius.

It is not strange. Population presses against the means of subsistence. Their whole time is taken up with the consideration how they shall procure food for the body; and they have no leisure for thinking, to show forth that which is in their minds. Whenever the number of the working classes shall be limited, rather below the demand for their labour, the power over the community will be wielded by them.

Barbette.

A pretty state of things that will be, when the servants command their masters.

Junius.

It will be the best of all states for a nation, when the ruling power shall be in the hands of the intelligent majority.

Captain Loochoo.

But what other specimens can you point out of this plebeian greatness of mind, this self-educated power?

Junius.

Did you never hear of Wade?

Captain Loochoo.

No. Who and what is he?

Junius.

He *was* a wool-comber at Leeds. He is the Editor of the *Black Book.*

Captain Loochoo.

Or democrat's text-book.

Junius.

Call it as you please, so that you mar not its purpose; and that is, luckily, beyond your power. As Martin's book of "Taxation" shows the mischief done to the community by the mode of collecting taxes, so this of Wade's shows to what extent the taxes are misapplied when collected.

Captain Loochoo.

He cards the higher orders of the land to admiration, I suppose. But is this carding of his betters the only proof you can adduce of your wool-comber's amazing genius?

Junius.

He is the author also of the "History of the Middle and Working Classes;" one of the ablest expositions which has yet appeared of the condition of society, and an equally able exposition of the mode of remedying the numerous evils it labours under. I should have liked the work better had its tone been more decidedly democratic; but as it is, it shows the author to be one of the fittest men of the day for the business of legislation, and it will be a proof of wisdom in any body of electors who shall make him their representative.

Sir Di.

One fault you must allow him to have, Junius, and that is, that, like Solomon, he is sadly ironical at times. Thus, in the book you have last spoken of—and which with you I think, upon the whole, an admirable work—he lauds Brougham for his "*steady pursuit of the great object of universal education.*" Steady, forsooth!

Junius.

You will be pleased to recollect that the Chancellor's public abandonment of the cause of universal education did not take place till early in the present year, when Wade's book was in its progress through the press, and probably not till after the sheet containing the passage you allude to —for it occurs in an early part of the work—was printed off.

Sir Di.

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Junius.

It would have been better perhaps if he had.

Captain Loochoo.

But who else have you to name?

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Yes, and on the occasion of the greatest political excitement known in this land for many years, he delivered a moral lecture on drunkenness, of more avail with his audience than all that all the Temperance Societies have ever concocted. I heard it, I tell you; I marked the glistening eyes and deathlike silence of the listeners, while many a hard hand was raised to dash away a starting tear, and the voice of the lecturer changed from its natural tones to the flowing harmony of glorious eloquence, heightened to its full effect by earnest passion, and deep sincerity, and strong enthusiasm, and entire forgetfulness of every thing but his subject. Even you, Captain, had you been there, would have forgotten that you were a place-hunter, and would have been struck dumb, like the rest, with the deep impressiveness of the scene.

Captain Loochoo.

All mere declamation. What did it prove?

Junius.

That there is much goodness in humanity — that intelligent and earnest teachers can find comprehending and believing audiences — that if the working classes of the community are not all they should be, the fault rests only with those who, possessing the power, neglect to instruct them.

Profile.

It seems all very pretty, but such men, after all, are of little use. There is nothing practical about them. All is of a general nature, fitted for the display of oratory, but nothing specific.

Junius.

You are in error. This same Rowland Detrosier has now become a lecturer on physical sciences, strictly practical and experimental, and he bids fair to become one of the most popular. Some of the oldest lecturers acknowledge the fact, in spite of the proverb—"two of a trade." These are the men whom the mechanics should select for teachers at their institutes, and their advocates upon all occasions.

Captain Loochoo.

Are there any others?

write; and no man would be fool enough to write for nothing.) But where do you find the samples of the intelligent mechanics you speak of?

Junius.

False Scot! Is Elliot, of Sheffield, nothing? He whose words are sharp and cutting as his own steel? He whose fire of passion glows and scintillates like a mass of welding iron. Think you that his words have not entered into the hearts of hundreds of thousands, and traced, as with caustic, the words, "No corn-laws?" Think you that the men of Sheffield will be slack to do his bidding, when he shall bid them peal their voices for the repeal of mischievous taxes? Is Samuel Downing nothing, even though he be reduced to earn his bread by the sweat of his brow; even though his powers have been shorn of half their development by stern necessity, which has strengthened his character while it has cramped its workings? Have you marked his varied powers; have you watched how his mind ranges from the minutiæ of art to the extremes of science, from the improved construction of a dome up to modelling of the mind of man? Have you marked how in him passion, and deep feeling, and the love of beauty, and the reverence for noble things, the perception of truth, and the possession of judgment, and the power of withering sarcasm, are all duly mingled; and can you doubt that such were the qualities which gave to the patriot Milton his glorious powers? By Heavens! the blood ripples through the half-stagnant veins, and the heart swells and pants high in hope, while thinking of these things. A mechanic, friendless and unknown, working fourteen hours a day, whose hand is familiar with the details of joinery and marquetry, and the delicate tracery of buhl-work, a cunning artist in iron and brass, and hard and soft wood, for the fabrication of those things which Luxury would rather lose her ears than exist without—this mechanic is found to possess the same mastery over mind as over matter; this mechanic is found to possess as refined and delicate sentiments as the wealthiest in the land, cradled in the lap of luxury. Oh! but there is hope for England, while such beings are found amongst her working men.

Crackwell.

The man really speaks as though he believed what he says.

Captain Loochoo.—(Aside.)

I think I'd go on the same tack—if I could get any thing substantial by it.

Barbette.

But, after all, this is mere declamation. You have cited two men of abilities, but they make nothing to the great mass of the mechanics. They are exceptions to the rule.

Junius.

Away! unbelieving soldier. I tell you they are but the outward indications of that which is within. Numerous are the lofty spirits lying beneath the surface, amidst the skilled labourers of the community. They are at present crushed by circumstances; but if other circumstances shall call them forth, the world will rub its eyes, and say, "How happened it that we knew not of this?"

Barbette.

It is somewhat strange that more of them do not show themselves.

Junius.

It is not strange. Population presses against the means of subsistence. Their whole time is taken up with the consideration how they shall procure food for the body; and they have no leisure for thinking, to show forth that which is in their minds. Whenever the number of the working classes shall be limited, rather below the demand for their labour, the power over the community will be wielded by them.

Barbette.

A pretty state of things that will be, when the servants command their masters.

Junius.

It will be the best of all states for a nation, when the ruling power shall be in the hands of the intelligent majority.

Captain Loochoo.

But what other specimens can you point out of this plebeian greatness of mind, this self-educated power?

Junius.

Did you never hear of Wade?

Captain Loochoo.

No. Who and what is he?

Junius.

He *was* a wool-comber at Leeds: He's the Editor of the *Black Book.*

Captain Loochoo.

Or democrat's text-book.

Junius.

Call it as you please, so that you mar not its purpose; and that is, luckily, beyond your power. As Martin's book of "Taxation" shows the mischief done to the community by the mode of collecting taxes, so this of Wade's shows to what extent the taxes are misapplied when collected.

Captain Loochoo.

He cards the higher orders of the land to admiration, I suppose. But is this carding of his betters the only proof you can adduce of your wool-comber's amazing genius?

Junius.

He is the author also of the "History of the Middle and Working Classes;" one of the ablest expositions which has yet appeared of the condition of society, and an equally able exposition of the mode of remedying the numerous evils it labours under. I should have liked the work better had its tone been more decidedly democratic; but as it is, it shows the author to be one of the fittest men of the day for the business of legislation, and it will be a proof of wisdom in any body of electors who shall make him their representative.

Sir Di.

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Captain Loochoo.

Are there any others?

Junius.

Look at the correspondents of the "Mechanics' Magazine." There are many men of high intelligence and good feelings, some calculated for teachers and others not; such men, for example, as Robert Potts, and J. S. the shoemaker of Mint-street. All these are outward indications of the spirit which overspreads the working classes.

Editor.

But, tell me, what specific things would you have done for the mechanics?

Junius.

Some day—when we get a thoroughly *responsible* government—universal instruction for young and old alike. In the meantime let us seek to do that which has not yet been done, to give them a general taste for refinement and the fine arts. Music, for instance.

Captain Loochoo.

Aye now we have you, now that you come to particulars. Teach men, working men, a love of fiddling! How absurd!

Sol. Sec.

How absurd, to be sure, Captain! Teach them the art of throat-cutting rather! What is there in a name?

Junius.

Visit the Regent's Park on a summer's evening, and watch the pleasure of the crowds who are listening to the itinerant bands. Some of the "respectable" people dwelling thereabouts wished to put them down as a nuisance, *i. e.* they could get music at the theatres, and did not care for those who went without. A wise minister would encourage street music of an improved kind to the greatest extent. A people refined by music are seldom ferocious. Music is especially a fitting thing to take under the charge of the "Mechanics' Magazine." As a writer in the "Westminster Review" most forcibly expresses it—"music is the poetry of geometry." The musical taste of the mass of the people needs refining. It needs more of high poetry. It is said that there are various advantages resulting from having steam-engines polished, which more than compensate for the extra labour thereby caused, and even thus may science reap advantages by being combined with the arts of refinement.

Editor.

All this is very good; but it still leaves unexplained the specific thing, in regard to music, which you would have done through the medium of the "Mechanics' Magazine."

Junius.

I would have you to make the mass of the community familiar with music of a much higher character than most of that they have been hitherto accustomed to—with music more calculated to awaken refined sentiment, and less of mere animal sensation.

Editor.

Have you seen Miss Flower's "Musical Illustrations of the Waverley Novels?" Do these come up to your standard?

Junius.

Yes, decidedly; 'tis a noble specimen of genius. But why should it be confined to a select few? Why should it not be popularised amongst the many? These songs are the philosophy of music, and were they known to the mass would do more to disseminate refinement than 25 per cent. rise in the price of wages. "They are a specimen of the songs of the world to come, when the human race shall have won the world from its monopolists, and learned to enjoy it." I am no advocate for indefinite tinkering upon a flute, or a fiddle, or a piano, by those who have neither taste nor capacity for execution; but where the native faculty exists, and can be cultivated without exclusive application, I would have it get fair play, alike in high and low, rich and poor. Those capable of excelling in music and singing may perchance not be very numerous; but all, with scarce an exception, are capable of receiving pleasure from music, through the organs of hearing, even when they understand not the cause of their sensations.

Tout-Voix.

But musical people are proverbially idle, and unfitted for anything else.

Junius.

That is, because music has not yet been generally brought home to people's firesides. They are driven abroad to seek it. The same objections may be made to apply to almost every other out-of-home enjoyment. Were music more general, the families of mechanics would associate more together, and a more general harmony would prevail amongst them. Why should not the mechanics, as well as the agricultural labourers at the harvest-home sing—

"Our work is over—over now,
The good man wipes his weary brow,
The last long wain wends slow away,
And we are free to sport and play.

The night comes on when sets the sun,
And labour ends when day is done."

* * * * * *

We will try hard, though, to secure for the mechanics such an alteration in human arrangements as shall give them the power of leaving labour long ere sunset. We will try whether three-fourths of a day will not provide them with the means of adequate sustenance, and all other appurtenances, leaving something for accumulation besides.

Captain Loochoo.

Ridiculous again! Diminish labour three-fourths, you will diminish precisely to the same extent the hitherto unparalleled productiveness of our manufactures.

Junius.

Well, Sir, the world would go on notwithstanding. There would not be one grain less of every thing essential to our pleasure and comfort on that account; and, surely, you must allow that human happiness is of more importance than either calicoes or muslins.

Captain Loochoo.

But the workmen would be starved. It would be half work, half pay, with the masters.

Junius.

Not so. The wages of labour depend on other considerations. The agricultural pauper gets as high wages for remaining entirely idle, as the agricultural labourer who toils from sunrise to sunset.

Barbette.

If they go into that question of wages, Mr. Editor, we shall not break up till daylight. There's Torrens there, rousing himself up for a three hours' infliction; and if Macculloch comes in, we shall be undone.

Editor.

Well, suppose we adjourn this particular question for the present.

Omnes.

Agreed! agreed!

Editor.

Return we, then, for a moment to music.

Sol. Sec.

I suppose 'tis "no song no supper."

Editor.

Not so, Solomon; come what will, there's a dish of cayenne for you. I was merely going to say, that though I think as highly of the influence of music as Junius does, I doubt the utility of attempting to instruct adults in this noble art.

Barbette.

True, true; there's myself. I'm not a *very* young man—but the notion of beginning the fiddle at my time of life—really.

Sol. Sec.

How do *you* know, *Major, you can't play the fiddle?*

Barbette.

I never tried.

Sol. Sec.

Then fiddle-dee for your argument.

Editor.

We're getting from "grave to gay" as usual, I see. The sooner, therefore, to supper the better. Junius, you'll stay with us?

Junius.

No, good Sir Editor; not that my spirit is averse from any thing in the nature of innocent enjoyment, but stern duty calls me hence. Before I leave, however, permit me once more to impress upon you all, that there is no reason—save ignorance—why working men should not possess as refined tastes, and as great a power of simple enjoyment, as the classes who do not work. They may not become adepts, but their enjoyment may be keener. In the words of the Westminster Reviewer:—"All are destined to act, and, in turn, be acted upon, by the spread of information, acquirement, education in the best sense of the word, amongst the great body of the people. To each and to all a mightier stimulus will be applied than has yet been felt, in the power of popular applause and enjoyment, which will be as the rod of Moses striking the rock; and streams of pleasure and refreshment will gush forth in what have hitherto been the barren wastes and wildernesses of human life." And now, fare ye well, gentlemen. If I have, in any way, grated upon your prejudices, forgive me. I would not, willingly, offend ye; but truth, and the desire of promoting human amelioration, is the paramount object.

REPLY OF "R." TO MR. JOPLING'S NOTE, p. 313.

Sir,—Although Mr. Jopling has been pleased to fence a little on the adjective "*unnatural*," I can assure him that I consider it very *natural* that he should support his position; indeed, I give him great credit for his ingenious note, which is doubtless intended as a refutation of some of my remarks on "The Practice of Isometrical Perspective." Mr. Jopling says, that isometrical projection is no more an unnatural perspective than plain plans and elevations. This reasoning reminds me of a question (though perhaps not strictly in point) which the boys used to put to each other in the school where I learned simple proportion, namely, "if a dozen of eggs cost 5d., what will a cart of coals cost?" Perspective is not im-

plied in the words, "plain plans and elevations;" and it is the approximation of isometrical projection to *perspective*, together with *this* latter term used to designate it, that makes it appear more unnatural than any other geometrical mode of delineation. I do not wish to stickle about words, for if isometrical perspective is to be looked upon as a geometrical representation at a certain angle, and this it really is, and nothing more—if it is to be viewed as a working drawing, or as a mode of representation by which the details of objects may be better expressed—I say it is perfectly consistent: but, if we are to look upon it as perspective, or as giving an idea of what objects, united as a whole, were, are, or will be, I maintain that it is both *unnatural* and *deceptive*, by all the laws of optics.

I, forsooth, have used the parallel ruler as well as the T square; and it may be fancy, but I consider the latter preferable to the former, inasmuch as there is less trouble with it, while it has all the advantages of the parallel ruler when made with a shifting head, or when a stiff-jointed sector is used on the square, by which any angles whatever may be drawn. But why should an explanation of a triangle or set, essentially necessary in drawing isometrical projection, not be equally useful to those who use the parallel ruler, as to those who use the T square?

If the 5th line in p. 7, were worth noticing again, I should say, that it is still my humble opinion, with due deference to Mr. Jopling, that as it stands at present *four* objects appear to be spoken of, whereas only *three* are intended.

I agree with Mr. Jopling, that an artist need not go to the top of St. Paul's to make an isometrical drawing of London; and there is nothing in my remarks that imply that it is necessary he should. He may do it quite correctly in his closet, aye, or make a bird's eye view either, with equal *accuracy*, if he have the requisite materials, though Mr. Jopling seems to think otherwise.

I can assure your correspondent that I have no prejudice in favour of any system; and that I have frequently measured the objects on the diverging lines, and as frequently used the proportional compasses, (which, at best, is but a clumsy *instrument,) but* I found that the *system that I have* laid down in my review was indeed the shorter way; and I now find that the manner in which I have described that system is *also* much the shorter method; and however abruptly Mr. Jopling may consider that I have broken off the description of the diagrams, they nevertheless contain the principles of the whole system.

It is by my proposition of making the lines diverge at an angle of 25, or 22½, instead of 30 degrees, that I considered that the confusion of external and internal angles might be *partly* avoided, and a *much* better view produced; not by the mode of representing the figure of the press, as Mr. Jopling signifies. I wonder he took no notice of this great inroad on the established system. No!—it was well; for what would then become of the diagonals, and the diverging lines to measure upon? The cube, the hexagon, and the circle, would then, alas! be discarded as auxiliaries, and the whole system foundered!!

The figure of the press was not represented to show its advantage over isometrical perspective, but to show a different mode of delineation; and, although the drawing may not be strictly correct, as it was done by an assistant and sent off to Fleet-street hurriedly, yet neither this, nor Mr. Jopling's attempt to prove it false, will hide the naked truth, that it *is* projected on principle; and that, too, on the same principles that a table or stool, standing at one side of a room, would be, if the interior of that room were represented in parallel perspective; with only this difference, that the diverging lines are parallel instead of radiating to a point. Does Mr. Jopling mean to say that all objects (projected on the principle of isometrical perspective) must be represented on the angle, as in the diagram of the cube? Is there no way of representing a cube but by giving it equal sides? If Mr. Jopling asserts this, how would he represent cities, where objects would present themselves at various angles? If he does not, how is the representation of the press a "false projection?"

In conclusion, I have now said all that I have time to say at present on the subject of isometrical projection; and I think that I have supported my reasons for calling it an *unnatural perspective*. I am only sorry that I am obliged to differ with Mr. Jopling, whom I only know by name; but whose works and opinions I

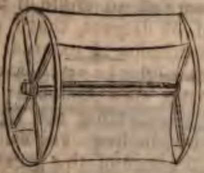
have every reason to consider as deserving to rank very high in the estimation of every one.

I remain, Sir, yours respectfully,

R.

Bayswater, Aug. 3, 1833.

THE VENTIPEDE, OR LAND-KITE.



Sir,—I send you a sketch of a species of land-kite, which I have lately constructed for the amusement of a few young pupils. I do not indeed, look upon it as an invention likely to be of much *use*; but since you must be aware that some of your readers are not too old to despise amusement, especially if it be of a novel character, I do not doubt but that you will for once suffer the *utile* to yield to the *dulce*, and insert my contrivance in your Magazine for their sake. This machine, or whatever other title it may deserve, is intended to be propelled by wind across a plain, and will run, in a tolerable gale, at the rate of 11 or 12 miles an hour, provided it be about four feet high. On Salisbury Plain, where there are no hedges, we have more than once lost it, through utter inability to keep up with its rapid pace. My sketch will give your readers all the idea of it that I wish to express; and I shall only add, that it is capable of affording much more exercise and entertainment than the largest kite that a schoolboy ever constructed.

I am, Sir,
Your obedient servant,
PHILOPAIS.

Salisbury Plain, July 2, 1833.

N. B. The name "ventipede" was given to it by one of my young companions.

NOTES WORTH NOTICE.

"Nothing is so instantaneously transmitted as LIGHT; nothing so penetrating as its rays. New facts are the light of science, bu, alas! neither so rapid nor so penetrating."

Advancement of Science Abroad.—The plan of a scientific *congress*, which originated in Germany, and has apparently succeeded so well in England, is making its way on the Continent. A meeting of the men of science of France is to be held this autumn at Caen, in Normandy. The objects of its research will be the same as those of our own "British Association," with the addition of History and Antiquities—two branches of science which appear at least quite as likely to benefit from *local* investigation as any other that could be named. The meeting is expected to be well attended, and the arrangements are already completed. There is likewise to be another congress, not connected with that of Caen, but composed exclusively of cultivators of Geology, from all countries, at Clermont, in Auvergne.

Another New Cemetery.—The cemetery at Kensall Green is about to be followed by another, from a design of the same architect, on the declivity of Highgate Hill, near the New Church, which forms so conspicuous an object from all points of the surrounding country. The spot, we believe, was formerly the pleasure-ground of the mansion-house which stood on the site of the present church, and was a few years ago the residence of the poet Coleridge. It is certainly well adapted for the purpose it is proposed to adapt it to; but the air of puff which appears about the speculation at its starting is any thing but a favourable augury for its success.

The Copernican System out of Date.—At the late Cambridge meeting a M. Demonville offered in vain to the notice of the scientific world a new system of the universe, which has been plumply rejected by the philosophers of his own country, as he asserts, without due examination. The principal novelties of his *system* are, that the sun revolves round the earth, and that all the planetary bodies, except the earth and moon, are mere "catoptric delusions." The object of his visit to England is chiefly to obtain the reward offered by Government for the discovery of the longitude, which, according to his own account, he is only prevented from obtaining by the refusal of the Royal Society to investigate his undeniable claims!

A "Dead Take in" Exploded.—The Liberia Humbug is at an end. A Public Meeting at Exeter Hall, at which Mr. Cropper, of Liverpool, presided, on Saturday, the 13th of July, gave it its death-blow; the resolutions passed unequivocally condemned the American Colonisation Society, and held forth its real objects to the glare of day.* After this, the hope of further subscriptions from this country, for the perpetuation of slavery in the United States, must be given up entirely—"Othello's occupation's gone."

Smithfield out of Town.—A very large building, consisting of covered sheds, inclosing an extensive square, has been for some time erecting, and is now almost completed, in the Islington Lower-road, near Ball's Pond. It is intended to supersede Smithfield as the metropolitan cattle-market, when the removal of that nuisance, which has been so long talked of, shall be determined on; but we are not aware that

* By the "Interim Notices" in a recent Number of the Mech. Mag., it appears that vast offence has been taken by some one at the Liberia scheme being designated a humbug! That appellation is amply justified now, at all events; and if the person who so complained be really a "Subscriber from the First," he must have seen the charges preferred in "Notes worth Notice," months ago, against the Colonisation Society, and the pledge of "Vindex" that the Society's agent should refute those charges *instanter*; and ought to have observed, that *the pledge has never been redeemed.*

the spot in question has been picked out for the site of the "New Smithfield" by any persons but its proprietors. Be that as it may, it is nearly ready for the purpose they intend it for; and they have even gone so far as to erect a large market house in the centre of the square. We presume, as a matter of course, that provision has been made for an establishment of *abattoirs* on the premises.

The last North Polar Expedition.—By the latest accounts of the enterprising Captain Back, it appears he has prosecuted his journey in search of Captain Ross as far as a station of the Hudson's Bay Company on the north shore of Lake Superior, and that he was still prosecuting his purpose with unwearied perseverance.

More Railways.—The Grand Junction Railway Company, whose plan is to bring Liverpool to within half its present distance (reckoning in the Turkish way, by hours,) from London, by uniting the London and Birmingham with the Liverpool and Manchester Railway, have obtained the Act authorising them to proceed, and are just about to commence the undertaking, so that we may expect the whole line from the metropolis to the great "northern hive" to be finished about the same time. The expense of the preliminary steps to works of this nature is an enormous evil. The Grand Junction Company have escaped better than their brethren of the London and Birmingham, but yet the cost of *their* Act has been no less than 12,000*l.*!

Dublin and Kingstown Railway. — Ireland is generally the last in the race of improvement, not always, perhaps, from her own fault. The Bill for making a railway from Dublin to Kingstown, the Blackwall of the Irish capital—an undertaking which was expected to prove of great benefit to the commerce of Dublin—has rather unexpectedly been thrown out in the House of Commons. The effect of this is usually only to delay the proposed improvement another year, and needlessly double the costs of the requisite application to Parliament.

Steam Coaches on Common Roads.—Steam travelling, since the disappearance of Mr. Hancock from the road, at the end of his late brilliant career, has been again at a complete stand-still. Seeing what they have seen, seeing what they see, the public must be convinced by this time that there is some obstacle to its progress, which the various projectors, who assure us there is no such thing, are unwilling to make known. It would throw a great light on the subject, if one of them would only give a plain statement of the expenses of a journey of, say, a thousand miles, not omitting the *costs of repair of the machinery*. Perhaps it is useless trouble to state, that the London and Paddington Steam-Carriage Company has not yet driven all competitors off the road; in fact, the said Company (?) has not yet got a single carriage upon it.*

A Revival and Removal.—The National Repository, whose exhibition whilom figured away at the King's Mews, at Charing Cross, and has for some time, after every symptom of an irremediable decline, appeared to be totally defunct, has of late, to the surprise of the select few acquainted with the fact, begun to exhibit symptoms of returning animation. In other words, although it was universally supposed that the exhibition of 1832 would be its last, (especially since the further gratuitous use of the Mews was denied,) the "Repository" has taken the improvement of the national manufactures in hand once more, and opened a room in Leicester Square with a new collection of specimens of British ingenuity, and invites contributions to its stores from all quarters most movingly. The importance of this unfortunate concern as an exhibition, however, seems to be quite eclipsed by the superior attractions of the private speculation, the "National Gallery of Practical Science," in the Strand.

F. H.

Bankers' Cheque Books.—"It appeared from a late examination of a London banker, that bankers are in the habit of furnishing cheque-books on the verbal application of any one in the name of any person who cashes with them. This is almost as sensible as it would be to provide a housebreaker with the necessary instruments to commit a burglary in your house. I would strongly recommend that cheque-books should never be furnished except on an application in writing signed by the customer (according to the plan of application for labels in the paper trade), and, that one of the banking-house clerks—*one* only, and he one of the most confidential—should be empowered to deliver all such books to the customers, personally, if possible, but, at all events, at their own residences. I would also remind all persons who keep accounts with bankers, that the only proper place of deposit for their cheque-books is the inside of the cash-box. It was only the other day I saw a cheque-book mixed with some children's play-things on the floor of a gentleman's parlour! When such instances of gross negligence are to be met with, who need be surprised that cheque-books so often get into improper hands?" ENORT. [The scheme sent us by the same correspondent, for preventing the forgery of cheques, does not seem to us sufficiently matured. He has overlooked two things; first, that no system of numbering cheques could be of any avail, unless it could be arranged that they should be presented in the same numerical order, which, of course, is impossible; and, second, that the dispatch of business requires that each customer should have but one cheque-book for sums of all figures.—ED. M. M.]

INTERIM NOTICES.

We regret that the length of Mr. Badnall's letter, of the 10th July, obliges us to defer its insertion till next week.

We are obliged to "A Wellwisher" for directing our attention to the character of a particular advertisement on the cover of our last monthly part. Its insertion was contrary to our general instructions on the subject, and arose, it appears, entirely from inadvertency.

Communications received from Dicky Sam—A Subscriber from the First.—G. L. S.—G. W.—Mr. T. Deakin—F. H.—Mr. Cheverton—Mr. Clarke—Mr. Edwards.

Erratum.—In the article on the "Patent Laws," p. 296, col. 1, line 16 from the bottom, for "nullify," read "multiply."

* And yet we observe every day, in the newspapers, an advertisement from the engineer and principal manager of this Company (such as it is), offering to supply steam-carriages equal to doing the work of any road out of London, with guarantee for the performance, &c. It is due to Mr. Hancock to state, that he is not the person we allude to; and that we have reason to think it is owing to no fault of his, that the late successful exhibition on the Paddington-road has not yet been productive of any practical result.—ED. M.M.

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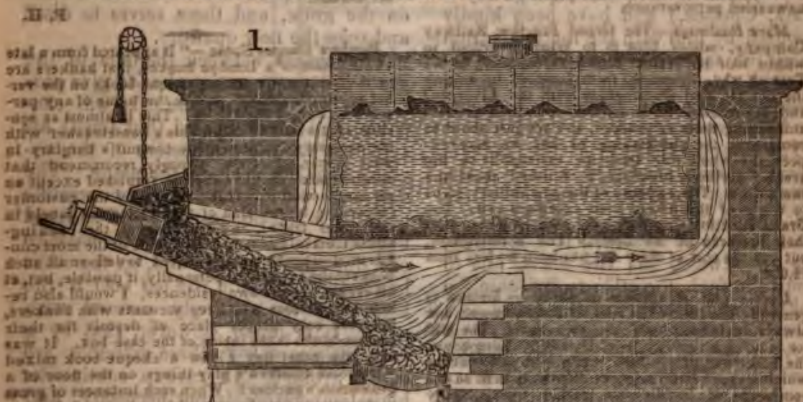
WITTY'S PATENT GAS FURNACE AND SMOKE CONSUMER.

1.



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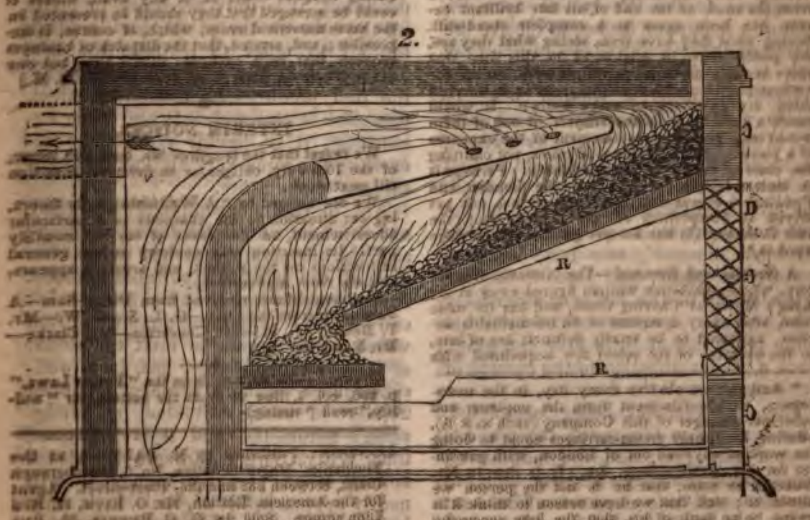


WITTY'S PATENT GAS FURNACE AND SMOKE CONSUMER.

The brief notice which we sometime ago extracted from the "Gardener's Magazine," of Mr. Witty's improved gas furnace and smoke consumer, having caused numerous solicitations to be made to us for further information on the subject, we applied to Mr. Chanter, the proprietor of the patent, (35, Cheyne Walk, Chelsea,) and have been kindly favoured by him with the materials from which the following more complete account of this important improvement in manufacturing and domestic economy has been drawn up:—

The common furnace, as the reader is aware, consists usually of a large grate, which forms the floor and support of the fire, and is surmounted by the boiler, or other body to be heated. It frequently, but not always, has two doors, one to admit the fuel, the other to facilitate the stoking, and drawing of the ashes. In Witty's patent gas furnace, on the contrary, a certain proportion, say about a third only, of the floor, consists of a grate (see fig. 1), between which and the feeder an inclined plane is placed at an angle of 30° to 40°; instead of the common door or doors, a sufficient orifice is well fitted by an iron box, the part of which contiguous to the fire is left open, in form of a hopper or feeder, to receive the charge of fuel; a flap is closed upon the fuel, and it is pushed forward on the inclined plane by a smaller box, or square piston, fitted within the hinder part of the larger box, moved by a screw, by which it is brought back to its first position when a fresh supply is required. An arch of brickwork, covered by the best non-conductors of heat, such as powdered charcoal, saw-dust, &c. surmounts the plane, and leads to the flue or the bottom of the boiler or other body to be heated. A breastwork of brick behind, projecting a little over the grate, gives a proper direction to the current of air rising through the fire.

This arrangement being completed, a fire is made on the grate; the plane is covered with fuel, and the mouth well closed; and the plane and the arch are thus converted into a retort. The heat of the fire and of the hot air rising *through it*, which is strongly *reverberated from the arch*, commences the *distillation of the nearer portions of the* fuel; the vapours or gases, as they rise, are whirled into the current towards the flue, and, meeting with the rush of heated air through the fire, are inflamed and completely consumed. This process continues till the coal is perfectly coked. When a supply is required, fresh coal is placed in the feeder, and thrust on by the screw and box, and thus the coke on the plane is pushed forward till it falls on the grate, and there serves to distil and coke the new quantity.

The spaces between the bars of the grate are so proportioned as to give passage to *more* air than the coke will consume, and leave heated (but fresh) air sufficient for the combustion of the vapours from the coal on the plane. The slag—of which the smallest possible quantity is left unconsumed—if suffered to accumulate, would impede the passage of a due supply of air; and, on the other hand, the air would rise too cool if the bars were too sparingly covered with coke. It is found, however, that by a very little care both these extremes are easily avoided. In case a continuous high temperature is not necessary, and that required is attained, closing the ash pit, by even a wooden door, sufficiently arrests the current of air to moderate the combustion; and when the heat is declining, it is only necessary to break up the coke on the plane, and readmit the air in order to rekindle the fire. Thus, while in the process of consuming, the fuel produces its maximum effect, this effect is accumulated; and when exhausting, it is quickly restored by re-exciting the same very high and advantageous temperature.

Air, in short, is completely excluded, except *where*, and *in the degree* required; and the temperature at last approaches that of the chemist's portable furnace. Iron is quickly fused, and only fire-brick can be used. The same quantity of fuel which barely serves to melt the solder or lead of the plumber, has, in a well-constructed portable furnace, produced 21,000° of heat, estimated by Wedgwood's pyrometer, and it is presumed that Witty's larger furnaces for steam boilers, when properly managed, will nearly approach this degree. It is only by means of such high temperature that we can completely consume that portion of coal, and especially of inferior coal, which, under low sluggish bur-

Fig. 3.

ing, is merely dispersed in noxious vapours, or wasted as useless cinder and slag; and hence the smoke, which in common furnaces is so great a nuisance, is in this effectually prevented.

The principle of this furnace has been also successfully applied to the construction of hot air stoves. Fig. 2 is a section of a plain stove of this description, lined with fire-brick, which lining preserves the hot air in a purer state than if it were reflected from an iron surface. Fig. 3 is an ornamental case, in which this stove is enclosed, and which, of course, admits of every variety and degree of embellishment. In the centre of the front there is an open door, covered by trellis work, through which both the light and much of the heat of the fire are reflected from polished plates, suitably arranged for the purpose along the sides of the interior vacant space, between the inclined plane and the ash chamber.

A highly ornamented globular stove of this description has been constructed for the Universities, and also a still *larger one, with appropriate embellishments, for a cathedral*; and so great is the power of the hot air stove in producing and distributing heat, that churches have been effectually and pleasantly warmed by it when other stoves had altogether failed. It has the further great recommendation of preventing general or even individual interruption, as it requires no attention whatever during divine service.

For the purpose of heating drying rooms, manufactories, offices, laundries, damp passages, rooms, &c., a simple and inexpensive stove has been constructed on this principle, which will produce any required temperature with a very moderate supply of fuel, and without the least annoyance from dust or smoke. A stove of similar construction to those used for hot-houses is stated to have been also applied, with the most complete success, to the various purposes of domestic economy, viz. to cooking, brewing, and baking. Another very successful application of the patent is, that to the flues of hot-houses and conservatories, of which Mr. Loudon speaks so highly: one furnace has produced the effect of two of the old construction, and the saving (dependin

on circumstances) has amounted to a quarter, a third, and, in many instances, a half.

We have perused a great number of highly respectable testimonials of the efficiency of this invention, and cannot do better than lay one or two of the more remarkable and recent of these before our readers:—

Application to Steam Boilers.

"Mr. CHANTER,

"Sir,—I beg to inform you that we have now tried your furnace, of Mr. Witty's construction, for four weeks, as applied to the steaming copper in the cooperage. I can confidently state that it fully answers our expectations, both with respect to the saving of fuel, and the consumption of smoke. From the best calculations we have been able to make up to this time, we find that we perform the same work with ten bushels of coal a day, which required, before the application of your furnace, sixteen and sometimes eighteen bushels.

"I remain, Sir,
"Your obedient servant,
"F. PERKINS,
"*For* BARCLAY, PERKINS, & Co."

"Park-street, Southwark,
Oct. 15, 1832."

Application to Warming Public Places, &c.

"Sir,—I had not an opportunity till this afternoon of inspecting and witnessing the operation of the patent gas furnace, at Stoke-upon-Trent new church. It affords me very great pleasure to state, that nothing could perform its work better. I had the furnace fed with fresh fuel (slack of the most ordinary kind), but there was not the least appearance of smoke. You deserve well of your country for this important discovery, which, I think, is particularly adapted to the warming of churches and other public edifices; and I hope you will have the reward you so well deserve, by the general use of your patent furnaces. I have considered it a duty owing from me to yourself to make this communication, and I shall rejoice if it proves in any way useful to you.

"Remaining, Sir,
"Yours, very obediently,
"JOHN TOMLINSON, Rector."

"Cliff Ville, Dec. 25, 1831."

Application to Pottery Kilns.

"*Mr. CHANTER,*

"*Sir,—In reply to your inquiries, we beg to state that we have two of Mr.* Witty's patent gas furnaces, of 2 feet 6 inches, in constant work at our manufactory, and that they have been so ever since June, 1829; that we find them to save fuel, consume smoke perfectly, and fully to answer the purposes intended.

"We are, Sir,
"Very respectfully yours,
"JOB MEIGH & SON."

"Hanley, Staffordshire Potteries,
April 12, 1832."

"Mr. CHANTER,

"Sir,—I have had one of Mr. Witty's gas furnaces at my slip kiln over two years, and find it to answer very well: there is a considerable saving in fuel, and is entirely free from smoke, which is a great object to me, my house and garden being near; the size is 5 feet. Upon the old pan of my slip kiln it consumed 42 cwt. of coals a day; with the gas furnace it only consumes 16 cwt., and gets the clay off equally as soon and well.

"I am, your obedient servant,
"JOSEPH STUBBS."

"Paper Mills, Longport,
April 14, 1832."

Application to Cooking.

"To Col. PAGE and Gentlemen Benchers.
"Middle Temple, London, 9th May.

"Sirs,—In compliance with your wish, I have examined the fireman and cook on the subject of Witty's patent smoke consumer, or gas furnace, erected to our steam boiler; the smoke is completely consumed in the operation of the furnace; the consumption of coal is reduced above one-third, and the labour of the fireman also; he is no longer exposed to the burning heat of the furnace when firing, as with furnaces of the common construction; the temperature outside is also considerably reduced—the fireman says full 10° on the whole. I consider it has answered every purpose intended, and much to the satisfaction of the cook, who says the steam can be got up more expeditiously, and kept more regularly than by the old mode; and I also learn that the Library, Parliament Chamber, and Hall, have been kept at a regular temperature since the introduction of this furnace.

"I have the honour to be, Sirs,
"Your most obedient servant,
"S. PHILLIPS."

"Treasury Office, Middle Temple."

Application to Hot-Houses.

"Mr. CHANTER,

"Sir,—After three months trial I can now give you an account of the difference

between your gas furnace and those on the old principle: it has that decided preference that it only requires to be made known to be universally adopted.

"I put the light on two vineries, 60 feet long (each), heated by hot water, on the 10th of January, the houses joining each other with a glass partition between, the boilers and pipes both of the same construction; as such we started fair. The result is, from that time until this date, the gas furnace is one month earlier than the old one, and both houses with as good a crop of grapes *as I ever saw grow.* In February I put the light on two more vineries, equally of the same construction, only heated with flues instead of hot water, one is worked with the old furnace, and the other with yours. Yours has again the preference of nearly one month; and I have no doubt I shall cut grapes a month earlier than the old one, and both houses as good as I ever wish to have. The one I have to a pine-house is certainly in the same proportions, but *the smaller one* you sent last to try the experiment, exceeds all; it is under a small boiler which works four 3 inch pipes, in a house put up on purpose, and, although but 8 inches, I consider it capable of heating any house, provided it is worked with hot water pipes The use of the gas furnace is the greatest saving that can possibly be invented, not only in the consumption of fuel, *but the labour;* and the uncertainty attending the old furnaces is entirely obviated, as one person can attend to *twenty of yours* with more ease to himself than he can to four of the old ones; and the certainty of leaving it twelve hours *in early firing,* without finding any material difference in the thermometer, will speak more for this valuable discovery than if I were to write a volume on the subject. If you consider what I have written will forward your views, or add to the benefit of my brother horticulturists, you are at liberty to publish the same, and if any doubt should arise as to the statement I have here made, any one may come and judge for himself, by an application to

"Yours, respectfully,

"JOHN WILMOT."

"Isleworth, April 13, 1833."

"P. S.—I am now superintending a new arrangement in this neighbourhood, where a number of vineries, pineries, conservatories, &c. will be erected, to each of which will be applied hot water and Witty's patent furnace, as undoubtedly the best heat *that can be given.*"

HINTS TO WOOD ENGRAVERS, AND ON THE PROCESS OF DRAWING ON WOOD.

Sir,—The wonderful improvement effected in wood engraving, during the last few years, is truly astonishing. The exquisitely and delicately finished cuts that we frequently meet with, especially zoological subjects, are but little short of steel or copperplate engravings; and whether we look upon these, or upon the cathedrals of Jackson, the cities of Byfield, or the magnificent forest scenery of Williams, we cannot but admire the perfection to which an art is brought, that even those who have not numbered many years may remember to have been little better than what a schoolboy can now cut with the point of his penknife. Nevertheless, there are still many of the minor wood engravers that, if you were to take the length, depth, and breadth of them, they are "out, my lord, in all their parts." As I make this remark and those which follow with the best feeling, I hope that they will be received in the same spirit; and also that this class of engravers will accept a word or two on *shading, shadowing, dotted lines,* and *letters of reference.*

Every engraver should make himself acquainted with the laws of shade and shadows; but more particularly those who *draw* the objects on wood as well as engrave them. This subject, to be entered fully into, would require more space than you could afford to grant me. In large establishments the drawing on the wood and the engraving are two totally distinct occupations; and, doubtless, the union of the two branches, in many instances, is the cause of the wretchedly-finished cuts that we frequently witness. There are, of course, various exceptions to this remark—where the highly-talented engraver is also the first-rate draughtsman.

No cut can be well engraved that is not well drawn on the block, that is, drawn with neatness, precision, and accuracy; and in proportion to the perfect manner or slovenly way in which this is done, so will the impression appear when printed. Those who wish to draw on wood must always bear this in mind, as engravers in general are perfect machines, that cut whatever is before them, without exercising their judgment as to the possibility of the thing being right or wrong; indeed, many of them will

not take the trouble of altering a thing which they are perfectly aware is wrong, knowing that if they follow the drawing they are not responsible for any errors.

The grievous faults committed by minor engravers, in respect of shading, are, that they make their tints of an uniform depth, consequently, an unrelieved flatness is the result; whereas the proper way to represent the part of an object in *shade* is, to lighten that shade gradually as it recedes. Suppose, for example, that of three sides of an octagon, forming a bow window to a building, one side is in *shade*: now the corner nearest the light should be much the darkest, and from thence lightened gradually until it joins the shadow thrown by the bow. *Shadows* thrown by projections should be made decidedly darker than parts in *shade*; and all shadows get gradually lighter towards their extreme edge: this may be seen in nature by viewing objects at noonday. In representing shadows or parts in shade, or even tints, wavy lines are far preferable to straight or right lines; and every object, however white it may actually be in nature, should receive a slight tint when opposed to the sky.

Dotted lines are by most engravers very clumsily executed—this is owing to the little detached parts of the wood requiring to be rather stout to prevent their breaking off. The proper way to engrave a dotted line is, first to engrave a fine right line, keeping in view that the groove on each side of the line must be very narrow at bottom, in order to leave a good thickness at the base, as it were, of the line; then with your graver cut the line transversely, but not so deep as the grooves on each side, and each dot, which may be tapered as fine as a needle's point, by being strong at the bottom, will assume the form of a small cone or pyramid.

From the very clumsily engraved *letters of references* that we so frequently see on wood cuts, we are inclined to think that those who execute them are not aware of the process of punching out the letters. This alphabet of punches differs so far from the regular punches, that they strike the wood, and leave the letters in relief. This is done before the engraver commences his operations, and the internal parts of the letter, and all round it, are neatly cut out by the graver.

To those who draw neatly, and who should like to make their drawings on the wood themselves, in preference to having them distorted, as is frequently the case, when transferred by the engraver, &c., perhaps the following directions may prove useful:—

After being provided with a neat little 4 or 5-inch long steel square, and a short, stout, blunt-pointed burnisher, you must then be possessed of a little *vice!* Be not alarmed, I only mean a small wooden vice for holding the blocks, which is nothing more than two fillets of wood about eight inches long and one inch broad, screwed on to an inch thick board, about eight inches apart; you must also have two or three pieces of wood, the same size as those fillets, to fill up the space when a small block is to be drawn upon, and also a few wedges to tighten the whole firmly; these pieces of wood and the wedges must be only half the height of the block, to allow the little square to have full play. You must, however, have *one* piece of wood the exact height of the block, to hold one edge of the paper more firmly when the drawing is to be rubbed down. The drawing which is to be transferred to the wood must be executed in soft pencil—F. or H. B.; but if it is already done in ink, the outline, &c., can be traced or gone over with a soft pencil; then lay your drawing down accurately with its face to the block, at the same time fixing one edge of your paper tightly (with your wedges) between the block, and the piece of wood of the same height. The block must now be damped or moistened, but not too much, else it will not take the pencil; then with your burnisher rub hard on the back of your drawing until you have produced a regular transfer on the block. The lines will, of course, be ragged, but they are only intended to serve as a tracing, as will be shown anon. The blocks, as they are received from the hands of the persons who cut them out and prepare them, have a fine, smooth, polished, greasy surface, which will not take pencil; this is got over by having a small quantity of lead-powder dissolved by gum-water; no more of the latter must be used than will just mix the powder to the consistency of a paste (as the gum prevents the free working of the graver), which, being spread on a plate, is reduced to a state thinner than cream

—but not so thin exactly as milk. Dip a hair-pencil in this liquid, and with it wash the surface of your block all over, taking care to rub gently, and not to obliterate the tracing too much. When the block is dry the tracing or transfer will appear through a nice white surface, on which you commence your operations with an HHH pencil, sharpened very fine. For drawing straight lines the pencil should be cut the breadth of the lead one way, but as fine as the edge of a blunt knife the other way: the lines on the white leaded surface will be quite *sharp* and clean. The shading is done in China ink, in the same manner as on paper, and all the lines washed by the ink must again be renewed. Over the China ink you finish your shades and shadows with wavy lines, in the directions you should like them to be when printed, and, having put all the letters of reference on the original drawing, the block is ready for the engraver.

Any draughtsman who is in the habit of producing lines a hairbreadth past their place—drawing lines across others where they should not be, or not forming square angles properly—must give up the practice before he can draw well on wood. In fact, the greatest accuracy is necessary, and that which is intended by the minutest detail must be distinctly and decidedly shewn; and anything not meant to be expressly shewn in the cut must be omitted in the drawing, as every line *tells*. This is so far different from drawings on paper, inasmuch as many touches are given to them with the brush or pencil to produce the effect at a little distance, which, when closely examined, it can hardly be known whether they are intended for decided lines or not.

Drawing on wood is a very fit occupation for young ladies, and, from the neatness and delicacy peculiar to the sex, they are, perhaps, better adapted for this employment than men. Indeed, there is nothing masculine even in the operations of the engraver; and I should consider that those who intend to give their daughters what is termed a "genteel" business or profession, would do well to have them taught wood engraving. Young ladies in general, who have no fortune, and who lose their parents in early life, support themselves by the stage, or literature, or by becoming governesses. The first of these, as a profession for a young lady, few persons would recommend; and novel writing is now a very uncertain means of support, unless something entirely new can be produced; and, surely, no one will doubt but that the lady artist profession is a much more independent mode of living than that of a governess. Besides, wood engraving will doubtless in the course of time supersede most other sorts of engraving. It is a wrong notion, in reference to most cases, that a business unfits a young lady for the social and domestic duties of a wife; and this may be urged more strongly in respect of any thing connected with the arts. Had all our housewives had a knowledge of drawing and just proportion, our "merry homes" would be neat, orderly, and scientifically arranged homes, and would then produce an improved influence on the state of society. Drawing on wood, or any other sort of drawing, is, again, preferable (as a profession to a young lady) to the stage or literature, with a prospective view of her becoming a wife, because every thing connected with the occupation leads to order and sincerity; whereas by the stage or literature the feelings may be said to be prostituted by habitually *acting*, and perhaps only *acting*, the part of sincerity. Although there are, doubtless, many honourable exceptions to those of the latter pursuits, it is to be feared that there is too much general truth in the remark, taken generally.

Trusting that all those who draw on wood, and have a better method of doing it than that described, will communicate their methods, and that those who have never drawn on wood, and wish to do it, may benefit by the foregoing remarks; and also, that the *little xylographers* will excuse my hasty remarks.

I remain, Sir,

Yours, very respectfully,

R.

Bayswater, July 2, 1833.

THE ART OF SWIMMING.

Sir,—Your correspondent "Aquarius" has done me the honour of commenting upon a suggestion which I recently addressed to you. As it appears to me that

he has been led astray by the apparent conclusiveness of his theory, and as the mysteries of the art seem to be monopolised by a few individuals, I hope you will allow me to make a few observations upon the paper of my commentator, and the subject in general. And first I must observe that "Aquarius" is not sufficiently grateful for the opportunity which has been afforded him of promulgating his ideas, but on the contrary has adopted a tone not the most conducive to the elucidation of the truth. I make no apology for assuming that the manuscript, with extracts from which we have been favoured, is the production of "Aquarius" himself, but I cannot, after a careful perusal, grant his position, that the author's proficiency in the practice of the art is to be taken as conclusive of his knowledge of the theory. On the contrary, I hope to be able to shew that the theory is a paper theory only — very ingenious, but not founded in truth or confirmed by experience. Before stating the reasons which induce this belief, it is necessary to condense the observations of Aquarius into a proposition. His position I take to be this :—That the swimmer is chiefly impelled not by the direct stroke of the legs outwards, but by the action which takes place when the legs are drawn together from the points of their greatest separation. The passages subjoined* will, I think, ustify the correctness of this deduction. Now my objections to this theory of Aquarius are, that if it were correct, the swimmer's progress ought to be greatest when he performs the act of bringing the legs together from the points of greatest separation, whereas it is notorious that the greatest progress is observed to follow the direct stroke of the leg outwards, and that progress is in a great measure suspended till that act can be repeated.

Because, if Aquarius be correct, the effect ought to follow whether the legs be struck out vigorously or not, so long as they are by any means placed wide apart, and by any power forced towards each other; now Aquarius himself agrees with the multitude in considering a forcible stroke outwards essential to the art of swimming. And I must here observe that, by the admission, he has struck forcibly at his own theory, which in effect denies the value of such forcible stroke for any purpose except that of placing the legs widely apart where he incorrectly conceives their useful action to commence.

Because the triangular body of water contained between the swimmer's extended legs is only analagous to the inclined plane of Aquarius, when acted upon so forcibly as to offer such a considerable resistance as is not attainable from the strength which a man can exert in drawing his extended legs together, *that* motion being amongst the weakest of which he is capable, and vastly inferior to the force he exerts in striking out the leg when contracted.

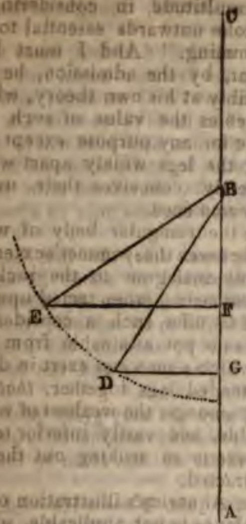
Because Aquarius's illustration of the inclined planes is not applicable, unless the legs be kept extended, till the feet are brought together, whereas the swimmer performs the operation of contracting the legs and bringing the feet together at the same time, which is the action pointed out by nature.

Because the manner of swimming used by some savage nations is the paddling method deprecated by Aquarius, and is with them more successful than that practised in this country; and because nature does not afford us any instance of swimming being performed otherwise than by direct impulse.

To prove to Aquarius that I am not ungrateful, I will here quote from a manuscript lying before me, (whose author ought to be well acquainted with the theory of the art, if the examination of false doctrines leads to the discovery of the truth,) my theory of the value of striking vigorously and widely at the same time.

Let A B C represent the line of the motion of the swimmer's body; B D the stroke of a bad swimmer; and B E that of Aquarius. It is evident that the surfaces which impinge upon the water are in proportion to the bases of the triangles B E F and B D G, and that the base E F is considerably greater than the base D G. It may, perhaps, be said that the difference is made up by the greater perpendicular length of

* "If the points C and D (the feet) be by any power forced towards each other, the consequence must necessarily be that the point B (the body) will be driven forward." * * * * "It can now very easily be seen why it is that those who in striking keep their feet close together, and so merely *paddle on*, make scarcely any way in the water."



stroke, as represented by the difference between B F and B G; but this is not so, for the stroke is of decreasing value, inasmuch as at its commencement it proceeds from and acts upon a body nearly at rest, while at its conclusion it acts upon a body in motion. Therefore the swimmer who presents the greatest surface with the most vigorous stroke is the most successful. But man not being formed by nature for this motion, and the surface he can command being inconsiderable, his strengh is wasted by the effort to give that small surface the greatest resisting power, and therefore I come to the point where I originally started, namely, whether it is practicable to afford him greater surface whereon to exert his strength, which, notwithstanding the doubts of Aquarius as to artificial adjuncts, I still think worth consideration.

There is little else in Aquarius's communication requiring remark, but I may inform him that I am not so bad a swimmer as he supposes, though I never had the good fortune to see Dr. Bedale, nor any one who progressed five yards at a stroke. I suspect that when he saw that feat performed, the tide had turned, and that his friend had his face towards the sea. Aquarius's expression, of my "tying a clog" to the feet of the swimmer, is unworthy of him. It only shews that he has lived long enough to learn the value of the adage, "Give a dog a bad name and hang him."

I am, Sir,
Your obedient servant,
G. W.

August 8, 1833.

THE UNDULATING RAILWAY.

Sir,—Your Magazine of the 22d ult. only reached me on the 4th inst., owing, no doubt, to some irregularity in forwarding the weekly numbers from London. I am sorry for this delay, inasmuch as the letter of your correspondent, T——s H——d, is calculated to throw a shadow on the truth of my assertions, which I should have felt it my immediate duty to dispel. I shall also take this opportunity of alluding to Mr. Ham's problem, as well as to the letters of S. D., S. Y., and Junius Redivivus, considering that the appeal I was compelled to make *to anonymous correspondents*, in my letter of the 9th of June, could only bear date from the date of its insertion in your Magazine.

Taking each communication on "the Undulating Railway," which has appeared since my last, in succession, I will commence with Mr. Ham's problem, though S. Y.'s solution of it may probably render mine unnecessary.

I am most happy to welcome Mr. Ham on the arena, and should be equally so to find other men of science, whether friends or opponents, inclined to discuss this subject as it ought to be discussed; not by *assertions*, and, as I have before observed, *unsubstantiated opinions*, but by a train of mathematical reasoning, and the production of such mathematical evidence as may lead to the exposure of the fallacy, *if that fallacy exist*, or to the unquestionable establishment of the principle, *if it can be established*.

Now, Mr. Ham's problem is a very important one as regards the *practical* operation of the undulating principle. He has probably limited the distance to three miles, with a view of proving this; for there can be no doubt but that the descent down the lower line (see diagram, page 179,) is much more rapid than the descent upon the regular inclined plane. This, however, would *not* have been the case *had* the distance been much extended. But as no such velocity as that attainable at the point B can ever be at-

tained in practice, even *three miles* is *more than enough* to prove the position which, I conceive, he wishes to establish. It must, however, be borne in mind (see the diagram in my reply to Mr. Cheverton), that the difference in velocity, shewn by the answer to this problem, bears but a very small proportion to the difference in the velocity capable of being mathematically shewn between a curved and *horizontal* line; nor could the practical results be measured by the same calculations; and for this reason, *whatever given distance might be proposed to be traversed on a horizontal plane, and a plane of equal length, consisting of numerous undulations, the time required to traverse* EACH *undulation must ever be less than that required to traverse a* PROPORTIONATE *length of horizontal plane, supposing* (as Mr. Ham says) *both carriages* "*to start from and end at the same points.*" In theory (supposing friction to be annihilated) *this* can be *mathematically proved.* In practice, it is also an unquestionable fact, and capable of mathematical demonstration, until we arrive at *flying speed*, or until, in other words, the *axle friction becomes equal to the rolling friction*, when the carriage would, by *periphfrugal* force, be absolutely raised from off the rails.

In answering Mr. Ham's problem, we must, of course, have data to work upon. I therefore suppose that a body will fall down the *upper line* one yard in the first second of time, and two yards down the lower line *in the same* time. The different angles of inclination will warrant me in drawing this distinction. Throughout the whole of the upper line, it is evident that the velocity will *be uniformly* accelerated in the proportions 1, 3, 5, 7, 9, 11, &c., &c., &c.

Down the lower line, the velocity *for the first half mile* will also be *uniformly accelerated* in the proportions 2, 6, 10, 14, 18, &c., &c., &c.; but *throughout the second half-mile* the velocity will be *uniform*, and the space passed over in each second will be according to the maximum velocity attained at the *end* of the *first half-mile*. So in regard to the third and fourth half-miles—throughout the former the velocity is again *uniformly* accelerated, throughout the latter *uniform;* and so in the 5th and 6th half-mile—throughout the former, *uniformly accelerated*, throughout the latter, *uniform*.

Thus we shall find that, upon the upper line, the carriage would run from A to B in about $72\frac{10}{12}$ seconds; and upon the lower line in $61\frac{1}{12}$ seconds. *On the upper line*, the first half-mile will be accomplished in $29\frac{5}{6}$ seconds, the second half-mile in $12\frac{1}{6}$ seconds, the second mile in $17\frac{11}{12}$ seconds, and the last mile in about $13\frac{5}{12}$ seconds.

On the lower line, the first half-mile will be traversed in about 21 seconds, the second half-mile in $10\frac{4}{9}$ seconds, the third half-mile in $8\frac{4}{5}$ seconds, the fourth half-mile in $7\frac{4}{9}$ seconds, the fifth half-mile in $6\frac{10}{12}$ seconds, and the last half-mile in $6\frac{5}{12}$ seconds.

It will give me very great pleasure to read the resulting opinions of so scientific an individual as Mr. Ham on this subject.

Now for Mr. T——s H——d. I do not say it ironically, (for the courtesy and gentlemanlike conduct which I consider due to myself, I trust I shall never forget to pay to others,) but I wish he would cease to write anonymously. Is there any thing disgraceful in this discussion? Are we fighting in a bad cause? Or is science in so degraded a state that an *open* attempt to its advancement is an act of indelicacy or presumption? If not, why should any man fight with his visor down? A defeat in a good cause never can be disgraceful; a victory deserves its laurels: let me therefore entreat Mr. H——d, and some others of your correspondents, to meet me face to face. I am persuaded that your readers in general will sympathise in my feelings of regret that I should have *been drawn* into a field of battle, from which my courage in a good cause will not permit me to retreat, and be subject to the fire of opponents, who, concealed behind a barrier, place me in a position of danger which *they shrink from:* for even should I carry their battery, *they will escape without the loss of one drop of blood;* whereas, *if I fail*, I must inevitably be left "A CORPSE," without one friend, save *Junius Redivivus*, to bury me!

Mr. T——s H——d expresses a hope that the published resnlt of an experiment which he has tried will convince me that "my notions are erroneous," the result of which experiment "completely fulfilled his anticipations." Now,

Ir. H——d to understand that I t for one instant dispute, that if the Adelaide-street models the e were put in motion by a given either on the curved or horizontal , it would come to a state of rest nearly equal times. By reference treatise, page 82, it will be seen measuring the difference in mo- n, on one occasion the difference was only half a second. It must, r, be evident to Mr. H——d, that undulations were deep, the dif- *in the time* would be very appa- f he doubts this, an experiment isfy him. It was to this subject I larly alluded in my letter of the lay, wherein I state, " the time d to generate any given velocity urve depends upon the length and f the descending place. And the quired to *expend* any given velocity urve depends upon the length and f the ascending plane, whatever power employed." But this is reign to the real subject in dis- . All I have contended on this nd[all I wish to contend, is, *that a space* is passed over on the undu- than on the horizontal line in the *me.* But though a greater space ed over, the whole time expended momentum ceases may be very or precisely alike,—so much is ult dependent upon the particular f the curve at which the carriage when momentum is *nearly* ex- But Mr. H——d will say, in the e alluded to, a greater space was sed over in the same time. Now, e deny that during the time the *cas actually employed,* the carriage traverse that part of the curved on which *it was* employed, in less an an equal distance on the ho- l plane? But he adds, the *entire* pon the curve was *actually* LESS pon *the level plane.* This it cer- *hould not have been;* and if he an- he following questions in the af- e, and gives me, even confiden- the sanction of his name, I shall grudge the expense nor the time feel it incumbent upon me to de- n immediate journey to London, view of witnessing a decided f the inaccuracy of my own pub- statements.

Did he *satisfy himself,* before try-ing the experiments, that the railways were perfectly level? I ask this, because so many months have elapsed since they were put down, that nothing is more probable than that the levels should have been disturbed.

2d. If he did not so satisfy himself, did he, to avoid any chance of mistake on account of the levels not being exact, try his experiment from *each* end of *each* railway? If not, he certainly should have done so, taking the average times and *spaces.*

3d. Did he examine, which it was quite necessary to attend to when I was in London, whether the curved railway had not so contracted by heat as to press too tightly on the flanges of the wheels?

If he has not attended to these circumstances, I hope he will be induced to try the experiment again. Perhaps he will say I ought to have cautioned him on this head before. But judging that, in defence of his own opinion, he would be cautious in ascertaining that no trickery had been practised, I deemed it quite unnecessary.

But Mr. H——d says, " he did not make any further experiments, presuming that my statements are to be relied upon." I sincerely thank him for his confidence, but I should have greatly preferred that he should have tried the experiment I recommended to *Junius Redivivus*, which is by far the most important and demonstrative, and favoured us with his opinions and reasonings upon it.

As it is, however, my intention to deliver, in the course of the summer, a lecture on this subject in London, I shall, on that occasion, have great pleasure in going through a series of experiments in the presence of any of your correspondents, at the same time producing such mathematical evidence of the truth and soundness of my position as must either satisfy them, or tend, by their subversion of that evidence, to my own discomfiture. I am *fully* prepared for all this *now*, but my engagements are such, that during this month, and the early part of August, I fear I shall not be able to leave home.

I now come to Mr. H——d's remark, that " my challenge to science is somewhat showy, and that I elude the grasp of opponents with adroitness." Now Mr. H. must be well aware that had

I not been attacked in your Magazine, he would have had little cause for such a declaration. The discussion led to the challenge, as the best means of extracting opinion. For issuing that challenge, I hope, after the remarks which accompanied it, that no apology can be deemed requisite; but *how* I have eluded the grasp of my opponents, by risking my reputation upon such a question, and in such a way, I cannot possibly conceive. Will Mr. H. explain in what way I have escaped from his disappointed grasp? I ask him to *disprove*, by mathematical reasoning or by experiment, a simple statement of facts. I would not have asked him to do this, unless both by experiment and mathematical reasoning *I was fully able* to establish those facts. If, in the course of another month, my challenge is not answered, I will give him MY *mathematical proofs*, and instead of disproving the question as it now stands, he shall have other ground to work upon. I must, in the mean time, with due submission to him, keep a little ammunition in reserve.

Mr. H——d's allusion to my incorrect notion of the "force of gravity" is fully answered in my letter to Mr. Cheverton. The force of gravity is an uniformly *increasing force*. Have we any mechanical power of like nature? Do the locomotive engines even keep up a *constant force*?

Mr. H——d says he has proved "*that the friction is greatest* on the *longest* line." Is he so easily satisfied? Let him describe a circle, measure the diameter, measure the length of the semicircle, divide the diameter into any number of equal parts, divide the semicircle into any number of like parts, consider a given weight, say ten tons, pressing on each part of the diameter so marked, and half that weight, say five tons, pressing on each part of such semicircle, the average angles of inclination of such a curve being forty-five degrees; then let him multiply the number of parts on each line by the weight pressing on each line, and *then* tell me that *the friction is greatest on the longer line*. Thus far I open my budget to him.

Mr. H——d concludes by saying, "I leave some singular and unquestionably false conclusions of Mr. Badnall to be answered by those of your correspondents to whom they may more particularly apply." Is this a fair mode of argument? I should be sorry thus to treat Mr. H——d, and should not easily forgive myself if I represented any man's opinions to be false, without having the generosity and candour to *declare* WHY.

S. D. is a candid and honest opponent. If he be in doubt he confesses that doubt. It is all I can expect. He again wishes me to substitute the lines C P and C G, for C D and D G. If I were to do so they could not possibly represent my meaning. I will, however, thus explain myself: "the amount of friction is as much less than it was on the horizontal line E A, as the line C D *is less than* the line D G; that is, if the pressure on the rail E A be five tons, and C D be ⅕th less than the line D G (or C P), the pressure on either the ascending or descending plane is only four tons." In regard to S. D.'s allusion to there being *more points* of contact in a curve than in a horizontal line, I must refer him to the diagram I have begged Mr. T—s H—d to describe. It is not the number of points of contact which must determine the total amount of friction, *but the difference in the weight pressing on each respective point*. The diagram in question cannot fail to satisfy him, if he allow that, at an angle of 45°, friction is reduced *one half*.

I now proceed to my new antagonist, S. Y. I hope I shall not be long in convincing him that he is erroneous in his view of the question. I confess that his formula puzzles me, and for one reason only, *that I cannot possibly understand it*. I can make out that if E A is equal to 16—and if the force of traction be equal to *n pounds*—16 *n* pounds may be supposed to represent the friction on the level line: but I will not allow that ("according to Mr. Badnall") 8 *n pounds* represents the amount of friction on each inclined plane; and therefore, though I do not understand that part of the formula which, according to S. Y., leads to the conclusion, I will not admit that the friction on the inclined planes is equal to the friction on level, viz.=16 *n pounds*. In fact, what the difference in the friction is between a body traversing a curve of any given dimensions, and a horizontal line, may be determined by the diagram which I have recommended to Mr. T—s H—d's notice, as well as by the diagram in my treatise to which S. Y. refers; and

ifference in the velocity attainable ich line is fully explained in my rks on the latter diagram, and proved e diagram exhibited in my reply to Cheverton.

at S. Y. says that as the velocity, ding to his inexplicable *calculatio* , *nsidered uniform*, the carriage must a longer time to run twenty miles sixteen. This is not very difficult omprehend: but how is it that he ls his argument upon so untenable sition, admitting (in theory) which y doubt does, and which no man g can deny, that whilst the velocity e level is *uniform*, the velocity down escending part of the curve is an uni-y accelerated velocity, and the velocity ent is proportionate to the velocity of nt? But S. Y. does not consider he velocity down an inclined plane be gained without as great an ex- of power as would be incurred in ning that velocity on a level; be-, as he says, the greater the velocity greater the expense of power, and can always gain speed at expense ower, without the inconvenience of d rails." Did S. Y. ever discover the attraction of the earth's centre diminished by any increase in the ity of any falling body? If not, what he mean by the *expense of power*. e speaks *only* of a body travelling an inclined plane, he cannot allude comotive power I should conceive; I confess that I can scarcely under- what he means. S. Y., however, ell comprehends the subject, that he s, upon his "examination of the ned planes, there seems good reason lieve that with the same power the will be greater on the curve than on orizontal rail." I cannot, however, ore than refer him to my challenge, to all I have written upon the sub- If he still doubt it, it will not cost more than 2s. 6d. to have a curve e, and a horizontal plane, and, by ing a ball with equal force on each, fy himself.

at S. Y. "has no doubt that the re- of the experiments are the conse-ces of peculiar circumstances which not been attended to." Will he state what those peculiar circum-es are?

Y. *declines entering at present upon actical objections to the* undulating railway. I honestly thank him for this. Let us have the theory *first* determined. Our present discussion will, in all probability, if ever republished, make one large octavo volume, and the practical part of the story will form, no doubt, the second.

Junius Redivivus says but little on the railway subject, in his reply to Mr. Cheverton, but that little surprises me. "He could not bring witnesses to prove that the brains were out, though nobody doubted that the body was a corpse!" What! so soon destroyed? And by the reasoning of Junius Redivivus in his first and second letters on this subject? If it had been so, I should indeed have considered an expensive education, and twenty years' reading and attention to scientific subjects, entirely thrown away upon me: but, *Diis gratias!* the undulating principle is still alive. "The bird is not yet down;" and Junius Redivivus may *load* and *reload*—may *shoot*, and *shoot again*, before he stands the slightest chance of ruffling a feather. To afford him this chance I will not consider him as an anonymous correspondent, but as one, who, declaring himself a hermit, is actuated by such philanthropic feelings as to render the concealment of his name an honourable act of modesty.

I am, Sir,

Your very obedient servant,

R. Badnall.

Liverpool, July 10, 1833.

P. S.—I beg to be understood that I shall consider all *mathematical or experimental allusions* to the undulating railway deserving of my immediate attention, whether published anonymously or otherwise. It is merely to avoid the expense of, to me, much valuable time, that I cannot hereafter reply to the mere expression of adverse opinions; and, in noticing this subject, I trust that none of your correspondents will consider that I am influenced by any feeling of disrespect.

[We shall give in our next Mr. Cheverton's reply to Mr. Badnall on that part of the subject which embraces the influence of gravity, and with respect to which it will be remembered Mr. Badnall has admitted that if Mr. Cheverton is right, he (Mr. Badnall) is wrong. We have also in hand, to follow Mr. Cheverton's paper, another by S. Y., who has addressed himself more particularly to the other branch of the subject, namely, that of friction. Several new auxiliaries to the anti-undulating side of the question have offered themselves; but we think it must be allowed that, for the present, Mr. Badnall has quite enough on his hands. We do not positively reject these communications, but shall reserve them—to be inserted if need be.—Ed. M. M.]

HEATON'S STEAM CARRIAGE.

Sir,—During a visit to Birmingham a fortnight since, through the politeness of Messrs. Heaton Brothers, I had an opportunity of examining and witnessing the performance of their steam-drag, and have much pleasure in bearing testimony to the success of their ingenuity.

On Thursday, August 1st, a new shaft having been fitted, in lieu of that broken, as described at page 272 of your Magazine, Messrs. Heaton started upon an experimental trip, for the purpose of ascertaining that all was right. In this experiment they took the most hilly roads round Birmingham, all of which the machine surmounted in fine style. Part of the journey was performed upon good Macadamised roads, part on the paved streets, and in some places on soft newly gravelled road; one very steep hill (rising one foot in six) was of the latter description.

Upon the good level road the speed was about twelve miles an hour, on the steepest ascents from four to five, and on the descents, at any speed that the driver pleased, from four miles an hour upwards, so completely is the machine under control. On the following day, Friday, Messrs. Heaton put their machine to a severe trial, the result of which completely established their success.

With a weight of machinery, vehicle, and passengers, amounting to four tons twelve hundred weight, it went three times in the day to Wolverhampton and back, a distance of about eighty-four miles, which, with stoppages between the journeys, it performed in fourteen hours. Its average rate of going was about eight miles an hour; which, with so great a load, on this line of road, is a very excellent performance. The weight of the machine itself is two and a half tons, the number of passengers carried was about thirty-four, placed in a van which was attached behind the steam-drag.

The steam-engine itself, which is little more than four-horse power, has no peculiarity beyond excellent workmanship; but Messrs. Heaton's success arises from the ingenious arrangement they have employed for applying the power of the steam-engine to the purposes of locomotion. In their machine they have the power of instantly changing the relative velocity of the engine and the propelling wheels, so as to obtain greater power and less speed, or, *vice versa*, according to the nature of the road traversed. Messrs. Heaton have also succeeded in mounting the whole of their machinery upon springs, in a very efficient manner, so that the engine suffers no jolting or straining, but works as smoothly and pleasantly as if it were stationary.

The arrangement of the machinery, so far as regards convenience and appearance, will admit of much improvement; but the principle of the thing is excellent, and really appears to leave but little scope for amendment. The triumphant progress of Messrs. Heatons' carriage, over a line of road most trying for steam locomotion, proves that not only is their principle good in theory, but also perfectly capable of practical application, and their experiments, in my humble opinion, completely establish the possibility of travelling by steam power, at a good speed, on common roads. The question of economy, I am aware, has yet to be established; but I have little doubt that Messrs. Heaton will shortly enlighten us upon that point. The cost of fuel is very trifling, and the expense of repairs, in a well designed and skilfully constructed engine, will, I expect, prove much less than is at present generally imagined.

Your readers will shortly be gratified with a description of the above locomotive, when they will be enabled to understand and appreciate the ingenuity displayed in its construction.

I am, Sir,
Yours, respectfully,
W. BADDELEY.

London, August 13, 1833.

ISOMETRICAL PERSPECTIVE—MR. JOPLING IN REPLY TO "R."

Sir,—As my object is, and I doubt not but "R.'s" is the same, that your readers ought not to have a wrong impression left on their minds, he will, I am sure, excuse me if I venture to write another note.

To prove the great utility of isometrical perspective to those of your readers who have not seen Professor Farish's paper, or Dr. Gregory's "Mathematics for Practical Men," the following short extracts may be given:—

is preferable to the common per- on many accounts. It is much in its principles * * * in bly more easy, and consequently curate, in its application."—*Pro- rish.*

method is peculiarly deserving tion of mechanics and engineers." *Gregory.*

rengthen these opinions, were it y, the following may be added:— a late meeting of the Society of gineers, at which we were present, rable map of a mineral district in berland, with the section, in differ- tions, of all the various strata, was d and explained, expressly for the of showing how well adapted iso- perspective is for this description ation."—*Gardener's Magazine.*

ps "R.'s" observations on the en to this particular projection by r Farish have appeared only to be ords; and, therefore, it may not sary again to notice them. But posed that had "R." been fully d with the idea of the extensive of isometrical perspective, he ot have so strongly and repeatedly ended a deviation from the angle that of 25° or 22½° as a *leading* In doing this he certainly advantage whatever; he may, please his fancy, but it is by sa- the greatest portion of the utility etrical perspective; and, as he most truly says, "the cube, the , and the circle would then, discarded as auxiliaries, and the stem foundered!!"

nust the "circle," whose repre- is frequently on three planes, in rical perspective," an ellipse of proportion, be "*discarded*," in make the leading angles of re- tion 25° or 22½°? This, I am R." will not any longer recom- f he will take an opportunity of n Mr. Elliott, in Holborn, who w him a regular series of isome- lipses, obtained by a method discovered and suggested to him, abled to rule the representations s in so many different positions, great accuracy and almost as ility as drawing circles or even es, is such an advantage of iso- perspective, that I cannot for a think that "R." will any longer end his *favourite angles.*

I would willingly say nothing more on other points in which I differ from "R.," because it is difficult to guard expressions so as not to hurt feelings, which, although "R." is totally unknown to me, I trust I should have no wish to do, even if he had not given so favourable an opinion of my endeavours to be useful. But, with respect to the perspective of the figure of the press, I think I should do wrong, both to "R." and your readers, if I did not say that it is my opinion, that if he will only carefully reconsider the matter, he will perceive that he is in error. Suppose, for example, I were to adopt this mode of reasoning:—If, on the principle of radial perspective, each of three sides of a cube be so represented (which they may be), so as to be exactly of the same figure, the angles of the three radii with each other would be 12°, and the boundary lines would form a hexagon of equal sides; therefore, isometrical perspective is true perspective, for it differs in nothing from true radial perspective but in this, that in the one case several of the lines are parallel to each other, in the other case not any.

"R." will not, I think, permit me to reason thus: he will, therefore, I trust, see the necessity of favouring your readers with the rule for *projecting* a cube, on principle, so that one face shall be a right-angled parallelogram, at the same time that two other faces appear in the projection.

I remain, Sir, yours respectfully,

J. J.

GENERATION OF HEAT—IMPORTANT DISCOVERY.

We copy the following announcement from the *Hampshire Telegraph*, of a highly valuable discovery, made by our esteemed correspondent, Mr. Rutter, of Lymington. We have ourselves been for some time in full possession of all the particulars, which are here only darkly indicated, but have remained silent on the subject, lest we should damage in any way Mr. Rutter's patent right, which has not (we believe) yet gone through all the customary formalities. As soon as we are at liberty to publish the specification, we shall do so. In the mean time, we shall content ourselves with observing, that great as is the importance attached to Mr.

Rutter's discovery in the following extract, it is, in our humble judgment, not estimated more highly than it deserves:—

"Mr. Rutter, of Lymington, already known as the author of 'A Treatise on Gas-Lighting,' has obtained a patent for a new method of producing heat, which is certainly one of the most useful discoveries of modern science. In large furnaces and manufactories it will almost entirely supersede the use of coal. But its greatest advantage will be found in its applicability to steam navigation. The principal ingredient employed for fuel in this new process is *water!* The only material required besides, is something in a liquid form which contains a large portion of carbon: whale oil, tar, or almost any thing of a similar kind will answer the purpose. As these materials are introduced into the furnace simultaneously, and in combination with each other, the one yields its carbon while the other gives out its hydrogen, and a small portion of atmospheric air is the only thing that is then required to keep them in a state of perfect combustion. The whiteness and intensity of the flame thus produced can hardly be imagined by any one who has not seen it, and yet is so completely under management, that in one second it can be reduced or augmented as occasion may require. It is almost unnecessary to add that it yields no smoke, and consequently the hideous funnel now used in steam-packets may be laid aside. But the greatest advantage of all is, that steam navigation may henceforth be employed in cases where till now it was altogether impracticable. A vessel may be so constructed, as to take on board, without inconvenience, a supply of fuel which would enable her to circumnavigate the globe."

THE PATENT LAWS AMENDMENT BILL.

The absurd Bill passed by the House of Commons, for the amendment of the patent laws, has, fortunately, come to nothing in the Lords. It was read a first time, as a matter of form; but none of their lordships could be prevailed with to move the second reading (though more than either two or three were applied to for the purpose); and on the Marquis of Clanricarde asking the Lord Chancellor what was intended to be done with it, his lordship gave the House to understand that, though he thought some amendment of the existing law extremely necessary, and was disposed to apply his mind in good earnest to the subject, yet *that any attempt to carry such a Bill as that which had been sent up from the Commons would meet with his lordship's decided opposition.* We happen to know that there were several other noble lords, of great weight in the House, who were equally prepared to resist the further progress of the measure. The consequence is, that the Bill for the present is lost, and that the whole matter of the reform of the patent laws must be gone into anew in the next or some other session of Parliament.

We believe we may take to ourselves the credit of having contributed materially to this gratifying result by our opposition to the Bill,—an opposition, be it observed, in which, as far as the press is concerned, we stood entirely alone. We transmitted copies of our strictures to all the leading members of the Upper House, and know that, in several instances, they exercised a decisive influence.

It now remains to be considered what is best to be next done, in order to procure such an amendment of the law as shall be of real benefit to inventors, and at the same time without injury to the public? We have not room this week to say all that occurs to us on this head, but we shall deem it our duty to take an early opportunity of returning to it.

The British Museum.—The number of visitors to the British Museum, during the past month, was no less than 35,000; or, on an average, nearly 3,000 every open day. This is exclusive, of course, of the frequenters of the Library, who are admitted only by tickets issued half-yearly by the trustees or librarians. The public, however, are admitted to view the outsides of the books in King George the Third's Library.—F. H.

Dr. Bedale.—Sir, Your correspondent, "Aquarius," seems not to be aware that Dr. Bedale was in London last summer for several weeks, and exhibited his powers in the "noble art" on various occasions on the Thames. On one occasion he swam down to Gravesend, and up again the following day (I believe). He also made some *excursions* up the River. He generally took the water at Somerset House. I believe his object was to establish a swimming-school, but he did not meet with the support he had anticipated.—I am, &c., N. M. B.

INTERIM NOTICES.

W. H.—Yes, and best thanks. A continuation at convenience will be acceptable.

Communications received from S. D.—Mr. Beverley.—J. H.—Mr. Symington.—A Woodland Farmer—Mr. Edwards—Mr. Clarke—Mr. Martin—Mr. Waldron—Tempora—S.—Enort—Paddingtonian.

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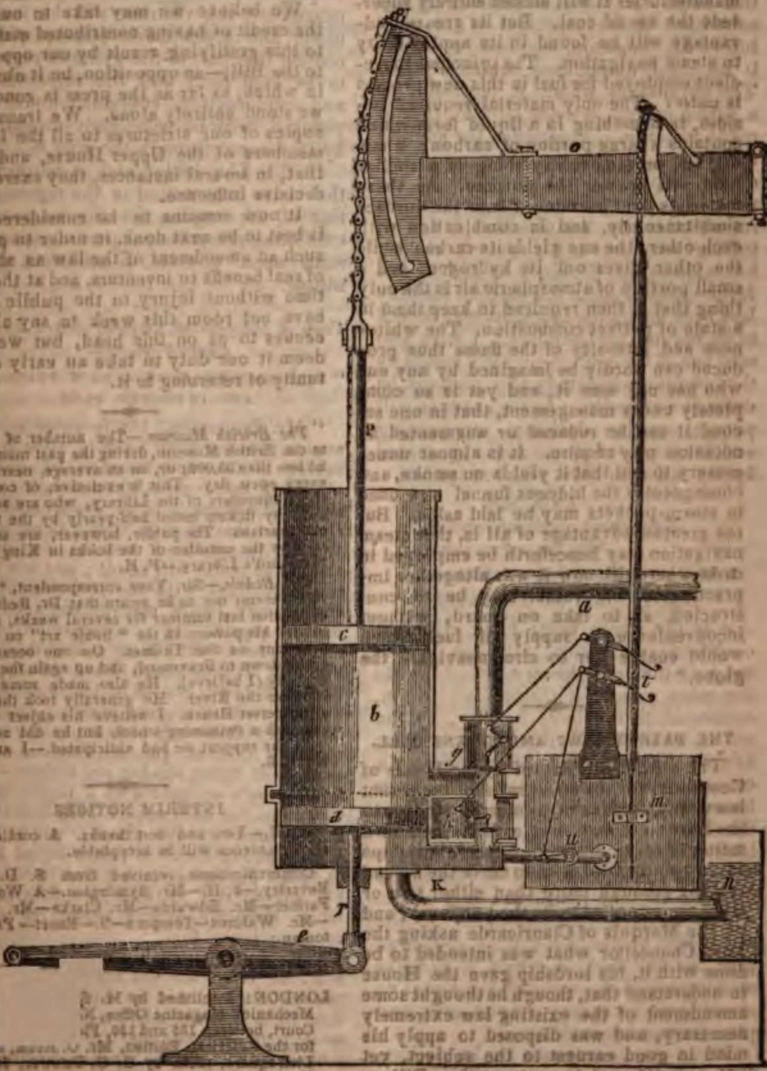
SYMINGTON'S ATMOSPHERIC ENGINE.



SYMINGTON'S ATMOSPHERIC ENGINE, 1784.

Sir,—I herewith forward a drawing and description of the improved atmospheric engine, invented by my father in 1784, and protected by patent for the united empire in 1787, which will supply the information which you considered (page 122) to be wanting on this head. A model of this engine was submitted to the inspection of the celebrated Mr. Smeaton, who bestowed upon it his most unqualified commendation. The advantages which it possesses, as a lifting engine, were so obvious, that in many instances it superseded the engines then in use, and among others even those of Mr. Watt. It was attempted, on the part of that gentleman, to prevent its introduction, on the plea that it was an infringement upon his patent rights; but wide as was the circle he had drawn for protection, after the strictest scrutiny had been made, the invention was proved to be beyond his boundary. I have also sent one of the printed circulars issued by the inventor, which may now, perhaps, be deemed a curiosity. As soon as time will permit, another drawing, representing another improved steam-engine, patented by my father in 1801, will be supplied.

I am, Sir,
Your most obedient servant,
WILLIAM SYMINGTON.

1, Mary-street, Bromley, Aug. 1, 1833.

Description of the Engraving.

a is the steam pipe; *b* the cylinder; *c* atmospheric piston, attached by the rod *p* to the lever beam *o*, which works the mine pump; *d* intermediate piston, connected to the lever beam *e*, by the rod *r*, which works through a stuffing box in the bottom of the cylinder; *f* a counterpoise attached to the end of lever beam *e*; *g* valve to admit steam from the boiler to the cylinder, which acts on both pistons, elevating piston *c* to the top of the cylinder, and depressing *d* into the required position; *h* a valve, which opens a communication to the under side of the piston *d*; *k* discharge pipe, on the end of which is a valve opening outwards, and into the vessel *n*; *m* cold-water cistern; *t* hand gear and plug frame; *u* injection cock.

When the apparatus is in the position *represented in the* figure, if the *communication from the* boiler to the cylinder be shut, the steam, having performed its office between the pistons, will be admitted by the valve *h* to the under side of the piston *d*, which piston will immediately ascend by means of the counterpoise *f*. The steam will continue rushing below to restore the equilibrium, while, at the same instant, the cock *u* will admit a jet of cold water sufficient to produce condensation. By this arrangement the vacuum will be formed under the atmospheric piston, without cooling that part of the cylinder required to be kept hot; and the injection air and condensation, contained under the piston *d*, will be completely discharged by its descent through the pipe *k*.

N. B.—The boiler and a portion of the beam are omitted in the representation of the engine, for the purpose of exhibiting the principal part of the apparatus upon a scale of sufficient magnitude.

Copy of the printed Circular issued by Mr. Symington, sen.

"FIRE-ENGINE UPON A NEW PRINCIPLE AND IMPROVED PLAN.

"Mr. Symington, the inventor of this engine, having been equally attentive to saving of fire and increase of power, obtained these ends by a simple construction and method of condensing the steam, so that at each stroke as perfect a vacuum is produced as the nature of steam and water will admit; and any person acquainted with the common old fire engine may easily manage and keep this one in repair. By a comparative trial made betwixt Mr. Watt's and this engine, at Wanlockhead Lead Mines, in Scotland, in the course of last summer, it appeared—both engines having a cylinder 36 inches diameter, consuming the same quantity of coal, and working an equal number of 8 feet strokes per minute—Mr. Symington's wrought with a power equal to 12 lbs. for each square inch contained in the area of the piston, whilst Mr. Watt's wrought with a power equal only to 9½lbs. per square inch; that is to say, his engine did at least one-fifth more work than Mr. Watt's, upon the same consumption of fuel.

"Having secured his property by patent, he offers the use of this much improved engine, and its various application by a new and advantageous rotatory motion, to all those who are concerned in mines, stamps, water works, draining of fens and lakes, grist mills, saw mills, breweries, or other manufactories which

require great mechanical powers. He intends to give, make, and put it up, upon most reasonable terms.

"*For particulars, apply to Mr. William Symington, Engineer, Wanlockhead, by Sanquhar, North Britain.*

"N. B.—Steam engines, upon whatever principles, may be converted into those of the above plan, at a moderate expense."

"London, February 21, 1789."

THE UNDULATING RAILWAY CONSIDERED, AS COMBINING THE FORCE OF GRAVITY WITH STEAM LOCOMOTIVE FORCE. BY MR. B. CHEVERTON.

Sir,—I did not intend to be drawn into further controversy on the subject of the undulating railway; but Mr. Badnall having acknowledged that I had narrowed the discussion to the true point at issue—having confessed that if "I am right his theory is wrong"—and having in defence thereof pointed out the several errors into which he thinks I have fallen, it is incumbent on me, as well as an act of courtesy to him, to justify the statements I have advanced, and to concede to him, what he wishes your readers in general also would believe, that if "I am wrong his theory is right."

It should be observed, that I have not, nor do I intend, to raise the question, as to the comparative amount of friction on the two kinds of railroads. On this point "S. Y." has entered the lists against Mr. Badnall, and to this respectable antagonist I leave him. Indeed, he appears himself to think it of minor importance, for he takes his stand on higher ground, and, staking the utility of his scheme on the correctness of his theory, stoutly maintains that, by calling to the aid of the usual locomotive force the extraneous force of gravity, he procures advantages which cannot otherwise be obtained. Here, then, we are at issue. Now, the gist of the question lies in a correct opinion; first, as to the kinds of force which produce motion; and, secondly, as to the nature of motion under mechanical circumstances, or as applied to use.

(1) Forces can be considered as only of two kinds—those which operate continually like gravity, and those which act only for an instant by impulsion. It would be an idle assertion to say, that steam locomotive force is not of the latter, but of the former kind, were it not that Mr. Badnall appears to dispute it, and says that I rightly construe his opinion in believing that he does not consider locomotive force to be of a similar kind to that of gravity. The difficulty of dealing with this opinion, arises from its being so evidently erroneous, that to controvert it appears like uttering truisms. Is gravity in constant action?—so is steam. Does gravity, in consequence thereof, produce accelerated motion?—so does steam. I really cannot imagine his meaning. Perhaps he stumbles at the ambiguity of the word *constant*, as used by me, in reference to steam locomotive force; and because steam, though constant or unintermitting in respect to time, is not constant, it may be in respect to intensity of force, and consequently would not produce *uniform* acceleration (independent of the air), he thinks that therefore it differs from gravity, which he probably considers is strictly a constant force. Not to insist that the essential character of each force consists in its being accelerating, and that it is altogether a matter of construction whether steam produces continually an equable force. I would remark, that even the accelerating force of gravity is variable, if we take in a considerable range. Of course, the resistance of the air will, in either case, continually diminish acceleration—it will not go on equably as in a vacuum. Perhaps Mr. Badnall thinks (and there are some passages in his communication which warrant the conjecture), that no force can be called accelerating, or be like gravity, which terminates in producing uniform motion. Undoubtedly locomotive resistance very soon exhausts the force of the most powerful engine, as rapidly as it can be produced, and an increase of velocity becomes unattainable; but such is also the case with gravity, notwithstanding Mr. Badnall is obliged to "regard the question with a philosophic eye" ere he can "*imagine* an extreme point, at which the *periphugal force*, being equal to the force of gravity, the average velocity might *possibly* become uniform." I have thought it best to quote his own words, because I must acknowledge they convey a meaning, in more than one particular, far beyond my comprehension. It is quite unaccountable, that neither here, nor in the passage immediately above, when speak-

ing of steam power, under the supposition of its being equal to and constant like gravity, that he does not advert to the resistance of the air, as being the immediate and *only* efficient cause of bringing about uniform motion; but speaks of *periphugal* force, and the diminution of adhesion to the railway, as producing it, though the former, it is surmised, belongs to the category of nonentities, and the latter is only a negative condition, or accidental cause, similar to a neglect of the fire, a frost on the rails, or the like. The immense resistance of the air at high velocities cannot be unknown to him. Has he ever calculated of how many hundred horses power an engine must be, in order to produce a velocity of 100 miles in an hour, in opposition solely to this resistance? Its effect in producing uniform motion in light bodies must be as familiar to him as the sight of a feather in the air, slowly and equably descending to the ground.

Perhaps Mr. Badnall entertains the idea (I beg his pardon for supposing any thing so absurd from him), that steam is only a constant force, or scarcely that, and therefore produces *uniform* motion; whilst "gravity is a *uniformly increasing force*," and therefore produces a uniformly accelerated velocity, and that herein is the difference between the two forces. If such should be his opinion, and really it is very like a key to his strange ideas on the subject, I would request him to investigate the whole matter afresh, when he will no doubt find, and acknowledge it too, that he has gone astray in this particular. It would be trifling with your pages, and with your readers too, to occupy any space to refute the notion that "gravity is a uniformly increasing force."

Though it is contended that the action of steam and gravity is similar in kind, yet it is admitted that it may be different in degree; that is, they may differ widely in the intensity of their forces, and somewhat in the uniformity of their action, but that will entirely depend on the arrangements for their development. An engine, with ample means for the generation of steam, would produce a force quite as powerful, and as uniformly constant, as could be elicited from gravity on an inclined plane at a small angle with the horizon; and there can be little doubt that ultimately the locomotive engine will be so improved as to be capable of producing the greatest velocity that could be permitted in practice, and gravity could do no more on an inclined plane of indefinite length and inclination.

I hope that I have now sufficiently established this point, respecting which Mr. Badnall says, that "I am equally in error whether I speak practically or theoretically," that the forces resulting from gravitation and steam are of the same kind; and, consequently, if equal in intensity and development, will separately produce effects similar in kind and equal in magnitude, provided only that the natural direction of the former force be taken into the account. Hence the inference, as bearing on the subject in dispute, is this, that a carriage descending by its own weight on an inclined plane, or impelled along a level by steam, will, under the premised circumstances, move in all respects alike—the proportion of the force to the mass, the friction and other conditions of resistance, being, of course, equal in each case. The rate of velocity generated will depend on the ratio of the force to the mass. If the inclination of the plane be great, that portion of the descending weight, which is converted into a moving force, will produce a velocity too great for practice. So, also, on the horizontal line, a powerful engine generating an equivalent force will produce the same result; but, whatever the velocity, acceleration terminates on each line at the same time, and uniform motion is thus produced, because the increasing resistance of the air becomes equal to the acting force. Now, as the results are alike, what are the advantages which Mr. Badnall gains, even in this supposed case of an inclined plane indefinitely prolonged? For if nothing is to be got when gravity constitutes the whole of the motive force, he surely will not contend that it is more efficient when it forms only a part of it, that is, when brought to the aid of steam. He will probably say that a continual force, equal in energy to gravity, or, rather, equal to that portion of it which in the proposed practice is brought to act on the mass, cannot be obtained from steam. This remark deserves attention, and shall have it presently. It must now suffice to say, that admitting there is an advantage herein, it is entirely of a prac-

tical nature; and not even that, unless it can be shewn that steam alone is inadequate to the production of all velocities within safe and useful limits. He may also say that gravity costs him nothing. He is right. In all cases, therefore, where the transit of goods is all one way, and all down hill, the advantage thus gained is as indisputable as it is *old*. Mr. Badnall, however, has the good sense to know, that in all other cases it must be purchased either first or last.

(2.) The second part of the inquiry relates to the nature of motion under mechanical circumstances, or when the greatest velocity is obtained, about which Mr. Badnall appears to entertain some erroneous notions; for, in a passage which I quoted in my last communication, he speaks of a force in action to overcome resistance, *and* (another) to maintain uniform motion, or the maximum velocity, as he expresses it, of 10 yards per second. He appears to think, that the continuance of such motion involves an expenditure of power, independent of what is required to cope with locomotive resistance. If such were the case the utility of his scheme would be unquestionable; but to correct himself herein, he should call to mind that a body once in motion will so continue, unless resisted; and hence if a force, independent of its own in virtue of its velocity, be employed to surmount such resistance, that then also such body will continue in motion, and for this simple reason, that there is nothing to prevent it. Again, if this force exceed the resistance, the excess can only find employment in generating more motion, and adding to the existing velocity; thus acceleration takes place, until the impelling and resisting forces are equal, or rather until their momenta are equal. After which time, therefore, all the power is employed in doing work, and not in producing motion. Hence the propriety of measuring mechanical causes and effects by the force multiplied into the space through which it acts, and not into its velocity, momentum having little to do with machines; for time is an element which enters into the question of the expenditure of power, in reference to a given effect, only as a consideration of convenience and utility. To the mechanical *force and effect*, as thus measured, *it has been proposed* by an eminent mathematician of the present day, to apply the terms *efficiency* and *duty*. The latter was introduced by Mr. Watt.

As I have classed the forces of steam and gravity together, Mr. Badnall will here be inclined to ask, whether gravity is not the cause of bodies falling, when, with uniform motion, they descend to the ground? I answer, that the *previous* action of that force makes them fall, the *present* action being employed in removing obstacles; for if the gravitating force was withdrawn they would continue to descend until the resistance of the air exhausted their acquired force.

It will now be seen that, *after* the acceleration of motion has ceased, the force of steam employed in impelling a carriage is solely occupied in overcoming resistance, or in doing *duty*, the amount of which is the distance to be travelled multiplied into the resisting force. Here let me again ask, what are the advantages which Mr. Badnall proposes to himself by his undulating line? Here is the work to be done—does he lessen either of its terms, the *distance* or the resistance? Unless he can do this, the expenditure of efficiency which represents the fuel must continue the same. He will not say he brings gravity to assist in doing duty, because he is aware that, if so employed, the force lent in the descent must be repaid in the ascent, and that a carriage can only traverse an undulation from summit to summit, either on the supposition of their being no resistance, or of an adequate force distinct from gravity being present to cope with it. If, indeed, the force required for *imparting* motion made any considerable demand upon locomotive power, Mr. Badnall's scheme would deserve some notice, because gravity certainly produces this effect without any cost. This is an admission which many of his opponents do not concede, and the truth of which has been to him a stumbling-block, for it has given a semblance of correctness to those confused ideas with which it has been mixed up. Let me state the case in his favour. A carriage on the summit of one of his undulations, provided with power just sufficient to meet the resistance, and to augment as the resistance increases with the velocity, will of course remain stationary until an additional force is found. Gravity is that force, and the

carriage proceeds with a motion accelerated through the whole of the descent, and ascends to the opposite summit in an equal period of time. Some will say, "Well, there is nothing got by that, for what is gained down hill is lost up hill." It is true there is no acquisition of power, and Mr. Badnall is not the man, as "Junius Redivivus" would have it, to say that there is, or that the carriage will ascend to a higher point than that from which it fell; but yet it must not be overlooked that the horizontal distance from summit to summit is gone over, and that the carriage is in a position equally favourable to travel other such distances, and that too without costing any thing, so far as the *moving* force is concerned. It should be remembered, too, that the cost of any other force in this particular will be in proportion to the mass to be moved, but here the same result follows whatever be the mass. All this being granted, what does it amount to—why that the force employed in first putting the mass into motion is saved,* which is a quantity so inconsiderable, compared to what is continually applied in opposition to resistance, as to be undeserving of notice; and this saving, it should be remarked, is only for once or upon one undulation (for the moving force is exhausted by the time the opposite summit is attained†); and therefore Mr. Badnall, in order to *perpetuate* (not to *repeat* or *accumulate*) this saving, is obliged to have a succession of undulations, or else one grand sweep from station to station. But this saving may be effected even on a level railway to a considerable extent, if it were thought advisable, for the smallest accelerating force, under the circumstances premised, would produce any assignable velocity in a certain range of time and space. Time, however, is an object, and the expenditure of power in the production of acceleration, beyond the minimum of force sufficient for a given effect, in the shortest period of time, is not in practice of the slightest importance. In proportion, too, as the resistance is increased by high velocities, and higher levels to be attained, will the amount of accelerating force be less than the amount of duty performed. In short, if it were desirable to overcome the inertia of rest in the mass to be moved, in less time than is now effected by the engines, there are a variety of better ways in which it may be done than by a waving of the whole line of road, whether the ground is favourable to it or not.

It will be recollected, that the duty performed on a railway is measured by the force of resistance multiplied into the space gone over, the time not being given. In a mechanical and economical point of view, or as a criterion of its efficiency, it is not of so much consequence what the time is in which a bushel of coals is consumed, as what the space is through which it is the means of force operating to overcome resistance, that is, to raise water or propel a carriage. In a useful or commercial point of view, time, however, is an element of the greatest importance in the estimation of a given effect. Mr. Badnall, therefore, may say, that though by his plan he may not be able to economise efficiency by lessening the duty on which it is expended, yet if he can lessen the time in which it is performed, though at the same comparative cost, he will have gained a great advantage. Undoubtedly he will, but then it is only on the supposition that unaided steam power cannot do the same thing. The increased velocity, as implied in the lessening of the time, implies also an increased amount of resistance from the air, not only in a given time, but in a given space; but as the question turns on the comparative merits of the two modes of applying locomotive force, and as this disadvantage is common to them both, it is only fair to Mr. Badnall, in discussing this subject, to abstract the addition to the duty arising from this cause, which consideration will account for the term *comparative cost* just used. To gain, then, this advantage of time, or to procure velocity, there must be, in the same proportion, a greater display of power in a given time; but as the time for the given distance is in the like but inverse proportion, the expenditure of force is the same in the same space, whatever is the velocity, abstracting as before. The comparative cost, then, being the same, Mr. Badnall's scheme claims attention on the ground of a

* So that the experiments on the model undulating railway were not illusory, but established a fact, just as it appeared, and for just as much as it is worth; hence the greater the load the more apparent and the more in reality was the advantage.

† *Mr. Badnall, in practice, would keep his carriage in rapid motion over the summits, but then it be at the expense of steam.*

greater development of locomotive force in a given time than by the ordinary method. He may so contrive the curve, and proportion the force of gravity to the locomotive mass, using it conjointly with steam, as a working or duty-doing force, as to produce during the descent the utmost velocity within governable limits. But then, to preserve this advantage, the time gained must not be *wholly* lost in the ascent, if it is in part. In part it must be, because the terms of the question supposes that the engine is incapable of putting forth an equal *velocity* of force. The point is, whether the greater efficiency of the engine, in consequence of the slower velocity, is equal at that velocity to the additional task imposed upon it in consequence of the ascent—whether an engine, borrowing an extraneous force, and effecting a high velocity thereby, is *more* than able to repay that assistance at a lower velocity—whether, in short, the momenta of the impelling forces are different at different velocities, and in favour of the lower velocity. We have thus lost sight of any supposed theoretical superiority, and are discussing matters strictly practical. The solution of the question mainly depends on the construction of the machinery. At all events, any advantage in this respect could only be obtained by the velocities, both high and low, being in an extreme unsuitable for practice; to say nothing of a cumbrous and operose construction of a road, in order to rectify an evil in the construction of the carriage which is to travel on it. It will scarcely bear comparison with "Junius Redivivus's" expedient for correcting the inequality in the tension of springs to their load. Rather let us bend all our efforts to perfect that wondrous engine, which is destined, sooner or later, in the various ramifications of its consequences on society, to effect a greater political, economical, and moral revolution in the world than has yet found a record in its history.

A few miscellaneous topics, and I have done. Mr. Badnall, in common with many more, appears to regard very lightly the resistance of the air. I am disposed to think that, in our rage for speed, and provided corresponding improvements take place in the formation of the road line, the stability and solidity of the rails, the diminution of percussion, the bestowing of needful elasticity, and in the more minute details of the wheels, bearings, &c., we shall not rest content until, on a level, the air will oppose nineteen parts in twenty of the total resistance. On this supposition it would be of little consequence if Mr. Badnall's scheme even annihilated the resistance from friction, whilst he makes us encounter the resistance of the air over a longer space. Besides, he gives us alternate fits of high and low velocities, and makes the resistance of the air greater than necessary, or than would be encountered with the average of those velocities; for he should remember, that this kind of resistance increases with the *square* of the velocity. Thus he increases the duty in both of its terms.

Having now exhausted the subject, I shall not occupy your pages in putting Mr. Badnall right in some particulars in which he has mistaken my meaning, nor in justifying the correctness of some assertions which he questions, as this would lead to useless and protracted discussion; and more especially as I have contrived to interweave with the preceding remarks several observations in answer to his objections.

I cannot, however, permit the opportunity to pass without returning the compliment he has paid me, in pointing out what he considers to be errors, by quoting the following paragraph in his letter for his reconsideration, which, he will permit me to say, with the greatest good will, contains so many incorrect and unguarded assertions, that error, he must admit, is at least reciprocal.

"The force of gravity not only produces a uniformly accelerating velocity, (in a vacuum), but the force itself is, in theory and in fact, (neither) a uniformly *increasing* force, (invariable on the earth's surface, or for all practical purposes, but, if that is out of the question, *decreasing* as well as *increasing*). Supposing, therefore, friction to be overcome (not necessary to be supposed), and a constant force to be exercised on any body traversing a horizontal line, the result would be, that the velocity would be uniformly increased (abstracting the resistance of the air); but as there is no mechanical force whose intensity, like the force of gravity, can increase with every increase of velocity (does not so increase), the difference in the velocity of two bodies, one descending an inclined plane and the other traversing a horizontal line, would be in proportion to the amount of increased power

brought into action by the nearer approach of the descending body to the earth's centre (not to the earth's *centre*)."

Mr. Badnall really appears to think that an increase in the force of gravity is the cause of increased velocity; if so, he certainly is *not* "correct in his views as to the laws of falling bodies:" but if he is not of that opinion, and is only alluding to that law of gravity, according to which it acts inversely as the square of the distance, then "an increase in the intensity of mechanical force, like the force of gravity," would be useless, as it would not differ perceptibly from a constant force. There is some radical misconception in his ideas on the subject, for he says elsewhere, "that uniform motion, practically speaking, never can be attained down an inclined plane." What, though it were nearly upon a level? Notwithstanding all that I have said, I beg to be understood as not giving an opinion on the propriety of an occasional use of an undulation, such as for the purpose of passing under a road or a canal. If civil engineers shall entertain a favourable opinion on this point, Mr. Badnall will have the credit of exciting attention to what may turn out to be a useful expedient.

In conclusion, and in justice to Mr. Badnall, I beg to state, that I have repeated some of his experiments on the model railway, and have no fault to find with his statements.

I remain, Sir, yours, &c.

BENJAMIN CHEVERTON.

P. S.—I fear that rather a prolix manner of treating this subject may be justly laid to my charge, and that Mr. Badnall may think I have not answered his challenge, by what he may consider "mathematical reasoning;" but it ought to be borne in mind, that the duty and the object of a writer in the Mechanics' Magazine should be general instruction and general comprehension, as well as the refutation of any particular fallacy, and that he ought to shew how that many mathematical subjects can be rendered plain, without resorting to that scientific language which, to Junius Redivivus, appears as a "puzzling combination of letters and figures." If it can be done without, so much the better; and though he may insinuate, I am sure he *cannot substantiate* the charge, that any *ostentation of this* sort is *my* besetting sin. It must not, however, be forgot, that, in the great majority of mathematical subjects, perspicuity and precision can be obtained only by the use of this language; and that it is as peremptory a requisite in undertaking the investigation of such things, as it is *to learn Spanish in order to understand Spanish.* How can it with propriety be said, that "scientific men inflict an evil by the use of language, which, though familiar to themselves, is occult to the mass of the community," when to interdict the use of such language, is, in most cases, to destroy the *only* instrument of thought and expression. There is no royal road to science. We must obtain a knowledge of the means of acquiring knowledge, and then, after the routine of instruction and acquirement, comes the philosophy of knowledge, or the higher power of investigating things, whether they be things physical or things intellectual. Junius Redivivus should distinguish between the well ascertained and easily recognised avenues of knowledge, and the Indian-like paths of explorement and discovery, in which even the initiated are lost, and towards which the neophyte dares not advance. "Whatever man has done, man may do." Yes, man in the abstract—not men. If Junius Redivivus doubts it, let him try. But the requisitions of knowledge are more exacting than this. The onward cry is, *man must do* MORE *than man has done,* or he advances not. To do only the former is not so small a thing as Junius Redivivus imagines; in some departments of knowledge it is all but impracticable, and to do the latter is all bu impossible. There has been but one La Place, and are there a dozen men in England who can even read him? Who, then, is to surpass him? I cannot inform Junius Redivivus "of the mighty obstacle to prevent him, or any other man of ordinary ability, from mastering such *scholastic* acquirement," for I never scanned its height, nor plumbed its depth profound.—Far be from me the giddy thought. To know, is to be humble and to be docile;—to know more, is to be humble, and to perceive, with feelings of reverence and admiration, the mighty things which have been done;—to know yet more, is to be humble, and to look around on the progress already made, to understand its comparative littleness,

and to catch glimpses, though darkly, of the immensity that lies before us—for knowledge is humility, and presumption is ignorance.

B. C.

NOTE BY T—S H—D ON MR. BADNALL'S REPLY TO HIM.

Sir,—You have already devoted so much space in your instructive and, I must add, very improved work, to the railway question, that I will *for the present* only request you to insert in your next Number the following observations on Mr. Badnall's reply to my former statements and experiments. Mr. Badnall must cease to call the opposition of his adversaries' *attacks* upon *him;* and, for my own part, I will say now, once for all, that, as a fellow-labourer in the fields of science, I heartily shake hands with *him*, but must continue to think differently on the *subject* at issue. Your able correspondent, Mr. Cheverton, has evidently taken the right view of the question, and in his hands and those of your other correspondents I leave it for the present, hoping that they will make such experiments on the models as will either confirm or refute what I have done and said; for I am too much occupied just now to repeat them. It is due to Mr. Badnall to state, that I did *not* attend to the circumstances he has pointed out, although I have no reason at all to suppose it necessary. And further, as Mr. Badnall has noticed with severity my observation on the falsity of his conclusions being left by me to the proof of others I now undertake to point out, *if he wishes it*, at least half a dozen such conclusions, and further to *demonstrate* mathematically, as I think I have done *experimentally*, which is better, that the resistance to the progress of a locomotive carriage will be greater on an undulating than on a straight railway, and the more so as the depth of the curves is increased. Here I leave the affair; and notwithstanding his wish to see my name (a matter of no consequence), I must again subscribe myself, your obedient servant,

T—S H—D.

London, Aug. 19, 1833.

THE "DESIGN FOR A STEAM-DRAG"—CORRECTION.

Sir,—I find that I made a mistake in fixing the lever to the front of the four-way cock in the steam-drag. I subjoin a sketch of this as it should have been:—

a is the steam-pipe; *b c* the pipes from the top and bottom of the cylinder; *d* the pipe to the condenser; *e* the four-way cock; *f* a toothed wheel, half the circle of the cock; *g* the lever; *h* the arm of the connecting-rod; *i* the crank. *The engine is at half stroke*, the crank descending; the curved passages are therefore between the pipes; but the toothed wheel having made a quarter turn, the communication would be opened between the pipe *b* and the condenser, and between the pipes *a* and *c*. The piston would then be at the bottom of the cylinder, and each successive half turn of the crank and small wheel would alter the position of the cock-ways.

This is the contrivance I wished to represent.

Whilst on this subject I may as well mention, that as the expansion of the main axle would force out the framework, if it were made of solid iron, it should be contrived with a square joint in the middle, or made of oak or some hard wood, fitting into square boxes at the ends towards the cranks on either side. For, it should be observed, that the object is, in this case, not to support the carriage, but to connect the crank.

An idea has occurred to me that the main axle may be altogether dispensed with in the construction of steam-carriages, by connecting the wheel or crank of one side with the steam-valves of the other side. So that when the piston-rod

of one cylinder is at half-stroke, it may be made to open the steam-valve of the other cylinder. But when the former is at half-stroke, it is exerting all its power on the crank, and consequently is propelling the vehicle, whilst the crank of the other wheel is passing the centre at top or bottom; thus the progression of the machine produced by one wheel, acting on the leverage of the other wheel, carries its crank over the centre, and supplies the place of fly-wheel and main axle. This is an advantage which the steam-carriage has over every stationary engine; and I am not aware that it has been noticed before.

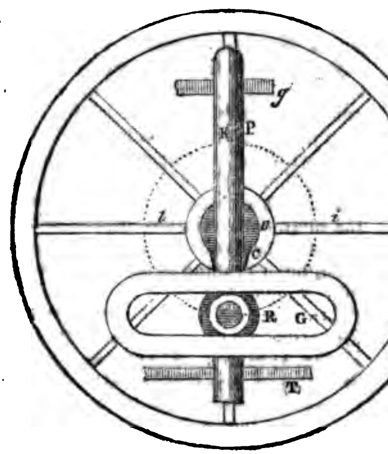
I am, Sir, your obedient servant,

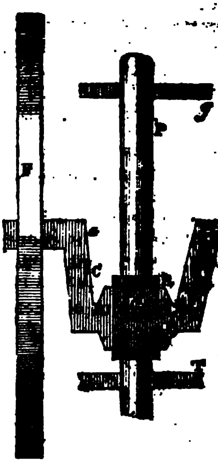
S. D.

SUBSTITUTE FOR THE CONNECTING-ROD IN STEAM-ENGINES.

Sir,—I have thought of the following plan for obtaining the rotary motion of a crank-shaft from the piston-rod of a steam-engine, without the intervention of a connecting-rod. It is this, namely, to form a transverse groove in the piston-rod, in which a brass roller, exactly equal to the breadth of the groove, and fixed upon the crank, is to run, and by which means a rotary motion would be given to the crank.

The contrivance may be applied to a stationary engine, with one cylinder, if it has a fly-wheel to turn the centres. As so applied, it is shown below in figs. 1 and 2; fig. 2 being a side view of fig. 1, with the addition of the half crank, &c. on the right hand.

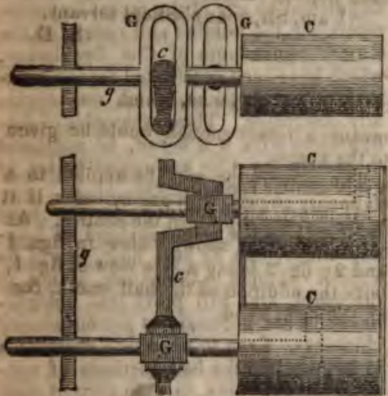




P is the piston-rod; G the groove; *a* the crank-shaft, and axis of the fly-wheel; C the crank; R the roller on the crank; and F the fly-wheel; *g* the guide to the piston-rod; T the top of the cylinder; *ikl* is the circle which the crank-roller describes. Suppose the fly-wheel to be revolving in the direction *ikl*. When it has assisted the crank over the centre *a*R, the steam entering under the piston, which is supposed to be at the bottom of the cylinder, forces the groove up, and the roller advances to *i*, when at the end of the groove; the pressure being continued from the under side of the groove, the roller returns along it until it reaches *k*, where the fly-wheel will carry it past the centre, and the steam at the same instant entering above the piston, forces the upper side of the groove upon the roller until it reaches *l*; and the pressure being continued, it returns into the position R, shown in the drawing.

But I particularly wish to show the use of this in a steam-carriage, as it was whilst thinking of how to improve the machinery of a steam-carriage that I first thought of it; and I am of opinion, that where there are two cylinders and two cranks, as in this description of machine, the centres would be more easily passed, and that this method would thus become a more perfect substitute for the

connecting-rod; besides, the saving of room which it would effect by bringing the cylinders closer to the crank-axle is of importance in the construction of steam-carriages. I have made a sketch of this application of the groove in fig. 3.



CCC are the cylinders; GG the grooves; *cc* the crank-shaft, or axle; *gg* the guides to the piston-rods. It will be seen that whilst one roller is in the middle of one groove, the other is at the end of the other groove, which is consequently exerting all its force on that crank with which it is connected, whilst the other, or first-named crank, is turning the centre.

I am, Sir, your obedient servant,

S. D.

August 8.

CITY IMPROVEMENTS.

Sir,—The utility of a direct continuation of the City-road beyond its present conclusion at Moorgate, is almost as striking to every observer as the great advantage of a straight street from the end of Oxford-street to Holborn, which has been apparent to every one who has ever cast his eyes on a map of the metropolis, from the days of Gwynne—if not before—to our own. When the latter scheme stands a chance of being carried into execution I know not, but the former, it appears, is at length to be partially effected. The London Bridge Committee have formally announced their intention of making a straight street from London Bridge to the Mansion House—of widening the narrow and inconvenient avenue called Princes-street, by the side of the Bank—and of *widening and altering Coleman-street.* This last notion spoils the whole affair. Coleman-street should have been left as it is, and an entirely new line have been chosen, direct from the top of Princes-street to the bottom of the City-road, or Moorfields. This course is so plainly the one which ought to be followed, that it would undoubtedly have been adopted at once, but that very great difficulties stand in the way. All these, however, might be got over with a moderate quantum of patience and a good deal of money. The City ought not to grudge the latter, when so great an improvement is to be effected by its application, especially at a time when alterations of far greater extent are going on at the West end. What will be the state of affairs when the proposed widenings, &c., have taken place? Merely that every vehicle and every passenger coming into the City by the chief entrance from the Court end of the town, will, on arriving at Moorgate, have to turn to the right, in order, after having gone a hundred yards or so further, to turn just as much to the left again! And that, with the exception of this short distance, there will be a magnificent *direct* thoroughfare through the very centre of the metropolis, and over the most splendid of its bridges! No difficulty ought to be suffered to stand in the way of such an improvement as this.

Much may be done, certainly, to improve the present wretched state of the entrances (the Lothbury one especially) of Coleman-street—any alteration *must* be an improvement. It seems rather strange, however, that the Corporation have made no alteration in the line of houses on Finsbury Pavement, now rebuilding. If it had been turned a little to the westward, the turn into the northern end of Coleman-street would have been made much easier.

I am not aware whether the Bill for erecting an Arcade from Moorgate to Bartholomew-lane, on the plan of Mr. Jeffery, is likely to pass this Session, but I suppose not. The Arcade would be almost useless if the direct line were adopted.

At last, it appears, the long-projected new street from Waterloo Bridge northwards is to be begun. That from the end of Farringdon-street to the North

road seems to be completely *in statu quo.*

Yours, &c., H.

London, Aug. 7, 1832.

Sir,—Under different signatures, particularly that of "C. D. S.," I have, as you are aware, wrote several papers on the improvement of the metropolis, which have been published in the Mech. Mag. I now venture (without a disguise) to direct the public attention, but more especially the attention of the committee and surveyors under whose direction the improvements in the neighbourhood of New London Bridge are made, to the tops of the splendid buildings erected and now erecting there.

Perhaps, without exception, in all these buildings, very great care is taken and neatness displayed in the finish of the chimney pots. But, it may be asked, how long is the present respectable appearance to last? Will every tenant of these houses be permitted (as is the general practice elsewhere) to employ potters and tinkers to disfigure, as much as possible, each house as soon as it is occupied?

It is surely worthy of an effort of the first city in the world, in the noblest improvements which have ever been attempted, to prevent the disgrace which will be the consequence, if each chimney top in these buildings is to be allowed to be altered to the base taste exhibited in cowls and tallboys, which, to the shame of the nation, are now to be seen accumulating with a rapidity unprecedented in both town and country, and on both old and new buildings. The neighbourhood of Belgrave-square, Regent-street, and Charing-cross may be mentioned, as places, perhaps, as much distinguished as any of the recent improvements, for the number and variety of the clumsy appendages of this description, which have been substituted for the neatness, if not elegance, which was originally observable. These examples of disfiguration will, it is hoped, be sufficient to induce the City authorities to try to avoid similar consequences.

If every chimney top, in the new buildings in the neighbourhood of London bridge, can be kept neat, it will be a noble example to the nation, if not to the world, and will prove that unsightliness is not necessary to prevent smoky chimneys. Even to appoint a committee to inquire into the best methods of constructing chimneys, so as to prevent their smoking, would not be unworthy of the City of London, engaged as they now are in improvements of such magnitude. Judging from all that has been done, it is sufficiently obvious that no individual can, unaided, usefully undertake such an inquiry. Count Rumford did much, but there is too much proof that he has not done all that was and is still required to render our houses comfortable, and our architecture respectable.

I am, Sir,
Your obedient servant,
JOSEPH JOPLING.

BEAM COMPASSES.

Sir,—If you think the cheapness and simplicity of the beam compasses, shown above, render their description worthy of publication in your useful Magazine, I *shall feel* happy to have presented them *to your notice.*

The sketch shows thatthey are simply formed of a piece of spring-brass, of the form A, bent to fit the bar and receive the pencil or steel pen—*not* soldered.

I am, Sir, your obedient servant,
IOTA.

THE MONTHLY REPOSITORY.

,—In your first *Conversazione* great was awarded to a periodical which known than it should be, owing to ely spread impression that because nmenced under sectarian auspices, e advocacy of sectarian principles, s therefore retained its original cter up to the present time, an im-on entirely void of foundation. I to the "Monthly Repository," by Mr. Fox. It has, indeed, been ily praised, for it is a work of a standard, inferior to no periodical matter, and beyond most in its aims ility; one of its peculiar character being the fact that the writers in it ot *litterateurs*, or trading authors, ring words together at so much per but men who are impelled to write se they think, and who consequently forth ideas instead of sentences; who seek to influence the minds of fellows, and destroy human preju-for the sake of increasing human ness. The work, in short, holds the rank in ethics as the Mechanics' zine does in physics. But it does im at mere dry morality: it em-s all subjects in which truth and y are to be found—all that can nce the human heart—and high ction is thus combined with pleasur-excitement. It treats occasionally itics, but not of party politics; the les to human improvement are unsparingly attacked, and all that end to human improvement is held praise. The reviews contained in only of the most important books, he criticisms are entirely honest and udged; unsparing to evil, and un-tingly yielding the meed to good. ghted views are taken of the ordi-courses of human life, and new sub-are frequently started. No preju-nor ancient prestige, no rule of caste, urped custom, is suffered to occupy ace of truth; there is no truckling hion, no keeping up of appearances. s are grappled with fearlessly, and referred to the only just standard, omotion of "the greatest happiness e greatest number." The work is atically a Magazine of Knowledge wisdom for the *People*. Its low —eighteen-pence, places it within each of most; and I would fain do my power to recommend it to the great body of the mechanics, as a text-book in which they will find their true interests constantly, disinterestedly, and fearlessly advocated; not with a view to change mere men in office, but to the end of remodelling all those institutions which are unfitted for the promotion of the pub-lic welfare. A great change has of late taken place in the character of literature. Specific books have ceased to attract pub-lic attention, and the greater portion of readers are now accustomed to draw their supply of mental food from the almost innumerable periodicals, which are, for the most part, cast by as waste paper when once read. They are merely ephemeral. But not such is the "Monthly Repository." The numbers of the last twelve months, since it changed its sectarian character, contain a mass of philosophy, in enticing forms, which might do credit even to the best selected library. It is to be regretted that the reading energies of the produc-tive classes of the community should bat-ten for the most part on so much mind-less rubbish as is put forth in a large portion of the periodicals from one penny up to three and sixpence. It is to be wished that their energies, instead of being thus fruitlessly diffused, were concen-trated upon sounder matter, which would yield them a good harvest of really use-ful knowledge, which would refine their tastes, teach them their duties, and the best mode of asserting the rights of free-men, and more especially that most valu-able of all rights, after freedom, the right to education. Had the "Monthly Repo-sitory" circulated to the extent of the "Penny Magazine" during the last twelve months, the minds of the many would, ere this, have assimilated towards a general estimate of the true objects of human life, viz.—human happiness. They would have been enabled more readily to detect the grain and to cast away the chaff in all matters of public in-terest, and the æra of improved institutions would have been nearer at hand. The works of Miss Martineau have done much towards opening the eyes of the people, in pointing out the science of political economy as a necessary knowledge to aid in removing the evils they labour under. The "Monthly Repository" goes still further, inasmuch as it grasps a wider circle of human action, and points out the latent good residing in many things which have been hitherto neglected. ...

removes the rubbish in which they have long been buried, and drags forth neglected treasures. It shews what human beings might be, while it opens their eyes to what they are.

In writing thus, I am aware of the imputations to which I lay myself open, inasmuch as I am a contributor to the periodical in question; but the suspicions of the unjust or the heartless, though I may regret, I cannot help, and it were a cowardly thing to abstain from doing that which the judgment approves, through fear of unjust or unconsidered censure. I praise the "Monthly Repository" for the same reasons that I should praise the "Mechanics' Magazine," because the objects aimed at are of a high nature, and the matter tends to human improvement. Aiming, however imperfectly, at the same objects, it need scarcely be a matter of surprise that I should seek such vehicles for the expression of my opinions and experience. Not doubting, therefore, that those who may chance to appreciate my motives will acquit me of egotism, and requesting that those who may not judge favourably of my motives, will rather reason upon the general tenor of my writings than upon this specific communication, ere they condemn me,

I remain Sir, very truly, yours,

Junius Redivivus.

Aug. 5, 1833.

SAFETY APPENDAGE TO THAMES WHERRIES.

Sir,—Within these last three weeks six persons, to my knowledge, have been entombed in the waters of the Thames, through the upsetting of those light fragile machines y'clept "Thames wherries." Prompted by that humane maxim of the Romans, that the individual who saves the life of a fellow citizen is more worthy of the civic crown than the greatest conqueror, I beg to recommend to your notice a plan, which, if universally adopted, would, I have no doubt, be the means of rescuing from an untimely watery grave many an otherwise devoted victim. Let every wherry be provided with caoutchouc balls (or oblong formed ones), one for each passenger they are allowed to carry, with a wooden handle attached to each end; and let these balls be of sufficient water-resisting power to support any person who holds by them in case of an unfortunate upset. Need I say how much better chance a person would have of being saved by this means than by that uncertain one (which even, however, seldom presents itself,) of clinging to the sides of the capsised boat or vessel? These little life-preserving appendages might be made sufficiently ornamental for a female to carry in her lap, the weight being next to nothing. Such balls might also form a useful addition to the Humane Society's ordinary apparatus, to be thrown to persons when at a distance, and when there is not sufficient time to approach them ere they sink. All steamers which carry passengers should likewise be provided with them.

I remain, Sir,

Your most obedient servant,

Enort.

July 8.

ON ANONYMOUS CORRESPONDENCE.

Sir,—My attention has been directed according to your request, to the remarks which you have attached, in the form of a note, to my letter of the 25th June, the result of which is, a hope that you may do me the favour to publish this allusion to them.

I think you scarcely do me justice in assimilating my feelings with those of Mr. Mallett, in reference to anonymous writing; the sentiments which that gentleman expressed towards $\phi. \mu.$, are such as I have never, for one moment, indulged towards any of your correspondents. On the contrary, I consider your dissent to Mr. Mallett's remarks not only highly becoming, but absolutely essential to the proper conduction and maintenance of a scientific Journal.

I cannot, however, exactly subscribe to the view which you take of anonymous correspondence, especially in reference to the present question. Let us suppose a case:—An eminent engineer, or a dozen eminent engineers, doubtful of the correctness of my theory, and the result of experiments on a large scale, *might*, by anonymously publishing their adverse, though conscientious, opinions, in a work so generally read as yours, most materially *delay* the practical advancement of the principle, *however good* and *valuable* it might be; but if those engineers, like myself, were to give to their opinions the sanction of their names, they would naturally be more cautious in the promulgation of their sentiments, inasmuch as every error they committed would not only be publicly manifest, but would in some measure, and very justly, affect their public fame—thus, "*Amittimus iisdem modis quibus acquirimus.*"

On the other hand, if my adversaries be anonymous, I cannot help thinking that I labour under considerable disadvantage, inasmuch as the public, the majority of whom rely *more* upon *what appears to them* the *common sense* view of a question, than *mathematical evidence*, being ignorant who those adversaries are, are frequently unable to form, on scientific subjects, a correct conclusion. Thus, having once entered upon the discussion, I might possibly be engaged for six months in doing common justice to myself, as regards public opinion, by replying, in self-defence, to anonymous assertions, at a heavy expense of time and labour.

You must not overlook the necessity of this question being immediately set at rest—nor must you forget that your Magazine is widely spread among individuals, who have a heavy stake in railway property. Am I then asking too much, when—not by any means, in a spirit of anger or ill-feeling, but solely for the more prompt development of truth—I beg your correspondents *either* to confine their remarks on this subject to *mathematical reasoning*, or to give to their *assertions* the sanction of their names?

I should deeply regret being the cause of any disappointment to your readers, by depriving them of a single communication, which they would otherwise have the opportunity of perusing, from your many intelligent though anonymous correspondents; and far more deeply should I regret the promulgation of any sentiment that might be, in the slightest degree, prejudicial to the success and well-doing of the Mechanics' Magazine; but, at the same time, I cannot conceal an opinion which I know to be well founded, viz. that there are many eminent men of science whose contributions would be welcomed by you, and who (not being inclined to write anonymously themselves) would have published their opinions on this and many other subjects in your Magazine, were it not for the objection they feel to open a discussion which might lead them into a contest with anonymous opponents.

I beg not, however, to be misunderstood: In cases where both parties write anonymously there can be nothing objectionable in any point of view; but where names are pointedly alluded to, or attacks *pointedly directed*, especially in cases of importance, I think it but reasonable that each party should stand on equal vantage-ground. I, it must not be forgotten, was originally attacked.

Not being able to construe the exact spirit of the two last lines of your remarks (page 262), the consequence which I may appear, by this letter, to attach to the subject of the undulating railway may probably excite a smile, or, perhaps, an accusation of vanity. Be it so: it must stand or fall upon its own merits, and I am quite willing, in a scientific point of view, to stand or fall with it. Whatever may be the result, I shall never accuse myself, and I trust I shall never be accused by your readers, of having published in your Magazine one opinion which I did not consider, after mature reflection, honestly deserving of attention; and there are few, if any, of your correspondents who have a more sincere wish than myself to assist in or encourage, for the future, the welfare of a work which is eminently calculated to advance the influence of science and civilisation.

I am, Sir,
Yours, very obediently,
RICHARD BADNALL.

Farm Hill, near Douglas,
July 24, 1833.

[Mr. Badnall's politeness and good humour are things a great deal more difficult to cope with than (in this instance) his arguments. We should be glad to agree, if we could, with so civil and right-minded a gentleman, and do not without pain continue to differ from him. He seems now to waive his objection to anonymous correspondence so far as regards letters containing "mathematical reasoning," and insists only on the propriety of those who deal in "assertions" giving "the sanction of their names." But what are we to understand by "mathematical reasoning?" Not surely such reasoning only as is shrouded in mathematical signs and symbols; but all reasoning which has truth for its basis, and the conviction of the understanding for its object; that is, in other words, which is mathematically just. Mr. Badnall would be inclined, we suspect, to limit the term to the former; but, according to our view of the matter, it is just as possible for a person who never solved a single problem in Euclid to reason with mathematical precision, even on so knotty a question as that of the undulating railway, as it is certain that expert mathematicians often reason most unmathematically. Mr. Badnall speaks in a tone of regret of people being disposed to "rely more on what appears to them the *common sense* view of a question, than *mathematical evidence*." We see nothing in this, however, to condemn, for we reckon as naught all mathematical evidence which does not finally resolve itself into something palpable to the "common sense" of mankind. As to communications made up of mere "assertions," we admit, that where the worth of an assertion turns on the credibility of the person making it, it is in that case (that only) quite necessary his name should be known; but we are not aware that Mr. Badnall has had any cause for complaint on this score, in the course of the public discussion which his ingenious scheme has undergone; and if, contrary to our impressions on the subject, there has been any thing of the sort, all that can be said is, that some one has made an assertion, which, for lack of the sanction of his name, ought to go for nothing. Can Mr. Badnall, or any other scientific militant, wish for more? So far, in short, from seeing anything to blame in anonymous correspondence—except as before excepted—it seems to us, that if we would wish to secure for any argument the fairest chance of passing for what it is really worth, and no more, the best of all possible methods is to send it forth

in this guise. The generality of people are but too apt to be led away by the authority of mere names; and, did the matter admit of proof, we make little doubt it would be found, that for one false notion of anonymous origin which has obtained currency, there have been fifty which have taken root solely because certain persons with a name in the world (as the phrase goes) happened to be the authors or disseminators of them.—ED. M. M.]

Spontaneous Ignition.—Late Fire at the Dublin Custom House.—It having appeared, in the course of the inquiry into the origin of this conflagration, that thirty-six bales of cotton waste wool, for candle wicks, had lain in store between forty tallow casks on one side, and ten leaky casks of palm oil on the other, Mr. O'Connell, who attended on the part of the merchants, suggested that the fire might have been caused by the oil mixing with the wool, and producing spontaneous combustion; in support of which view of the matter he quoted sundry passages from "Henry's Chemistry," and other scientific works. Mr. Oldham, the engineer of the Bank of Ireland, being examined, stated the particulars of three spontaneous fires which had occurred at the printing-room of the Bank, amongst the oiled rags which had been used to wipe the printing plates, and had then been thrown by in a heap, and he declared his conviction, that if the warehouse people in the custom house had made a pile of sticks, and applied a light, they could not have kindled a fire more effectually than they had, by allowing oil to leak in amongst loose cotton and wool. Mr. Ainsworth also declared his opinion of the probability of the fire arising from the mutual action of the cotton, hemp, or wool, and the leaking oil. Mr. Edmund Davy, professor of chemistry to the Royal Dublin Society, to the surprise of every one, stated his opinion to be that the fire could not have occurred spontaneously; that he was not aware that the fixed oils had any effect on cotton or wool when mixed with them in any proportion; that he had not read the opinion of any eminent chemist which differed from his; that all the authors who had written on the subject had written from hearsay, not from their own experiments; and that he was convinced a chemist might make a thousand experiments, with an earnest desire to accomplish the ignition of wool, or cotton and oil, by mixing them together in every proportion, and yet would not be able to succeed. He thought that, if ever such apparent spontaneous combustion did take place, it was caused by circumstances which had not been observed, or taken into account, at the time.

Perpetual Motion.—A correspondent in North Berwick writes us as follows:—"Mr. William Buckle, a respectable tradesman of this place, has, after many years close study and observation of the celestial bodies, discovered the perpetual movement. He has not only discovered wherein longitude consists, but longitude itself to an azimuth. He has prepared tables by which his calculations can be carried to any extent, and by which he can at any time, and under the most unfavourable circumstances, ascertain the longitude with the same facility and correctness, as latitude is at present by the nautical instruments now in use. These latter are entirely superseded by the use of an instrument constructed by himself, of the most simple description. He has every confidence in being able to explain and defend the principle and correctness of his discovery to any one, and is at this time endeavouring to bring it under the notice of government."—*Scotsman.*

French Day and Night Telegraph.—The telegraphs in common use in France have three arms, which form the figure of a T when in a state of inactivity; but recently another sort have been introduced by Ferrier, which have only two, and the arms do not stand in immediate connexion together, but are attached to two vertical poles, with an interval of ten feet between them. Two lanterns are fastened to the extremities of both these arms; one of them stationary, and the other so adjusted as to travel round its companion. A fifth lantern is placed between the two poles, and has a horizontal motion. The various positions of these five points, with respect to each other, constitute the several signals. This mechanism answers equally, whether for day or night use, for the lanterns being coated with black are as distinctly visible on a fine day as they are from their lights on a dark night.

Iron Tanks.—"Oh tank! tank! tank! more precious to the sailor than the golden vases of Persia, or the diamond-rimmed goblets of the Ottoman, who shall do thy merits justice? Who shall paint the manifold blessings thou impartest to those whose home is on the deep? Who but the hapless mortal doomed to calms on tropic seas, casting his eyes in vain to heaven for rain—who but the fevered wretch, whose parched lips have turned with loathing from the putrid slimy liquid engendered in casks, can truly appreciate thy value? Glory to thee, oh tank! Thou carriest the water of the Thames, in its original purity, to mingle with the sacred stream of the Ganges, and thou enablest the rigid Mussulman to cry, a miracle! as he performs his ablutions in water 10,000 miles from its source, as fresh and as cool as the rill from his marble fountain. Beneficent tank! Dispenser of health, and comfort, and luxury, to hundreds of thousands, had I invented thee I would drop my patronymic, and call myself Tank—my crest should be a tank—my household utensils should be in the form of tanks; and if I came to the peerage I would blend thee with my title—would dispute thee with my Lord Tankerville."—*Portsmouth Correspondent of the United Service Journal.*

The Undulating Railway.—Sir, To prevent any misinterpretation of my reasoning, when, in my letters of the 25th of June and 10th of July (see pages 259 and 346), I speak of the *velocity* of descending bodies being uniformly accelerated in the proportions 1. 3. 5. 7. &c.,—I mean, that the velocities of descending bodies, on the *separate spaces* passed over by them, *in each successive second of time*, increase as the numbers 1. 3. 5. 7. &c.—not forgetting the acknowledged rule, that the velocities are as the times, and the spaces as the squares of the times.—I am, &c., your very obedient, RICHARD BADNALL, Farm Hill, near Douglas, Aug. 20, 1833.

INTERIM NOTICES.

Mr. Montgomery's note has been undesignedly omitted in the making up; it shall appear next week.

Mr. Mallet also in our next.

Communications received from Mr. Waldron—Mr. Ham—W. H.—A. R. F.—T. M.—S. D.—Enort—Mr. Roffe—Mr. Baddeley—G. J.

Errata.—P. 259, col. 2, line 43, for "1. 3. 5. 7. 11." read "1. 3. 5. 7. 9. 11."

P. 346, col. 1, line 31, for "periph*ragul*" read "periph*ugal*."

P. 347, col. 2, line 18, for "flanges" read "*flanches*."

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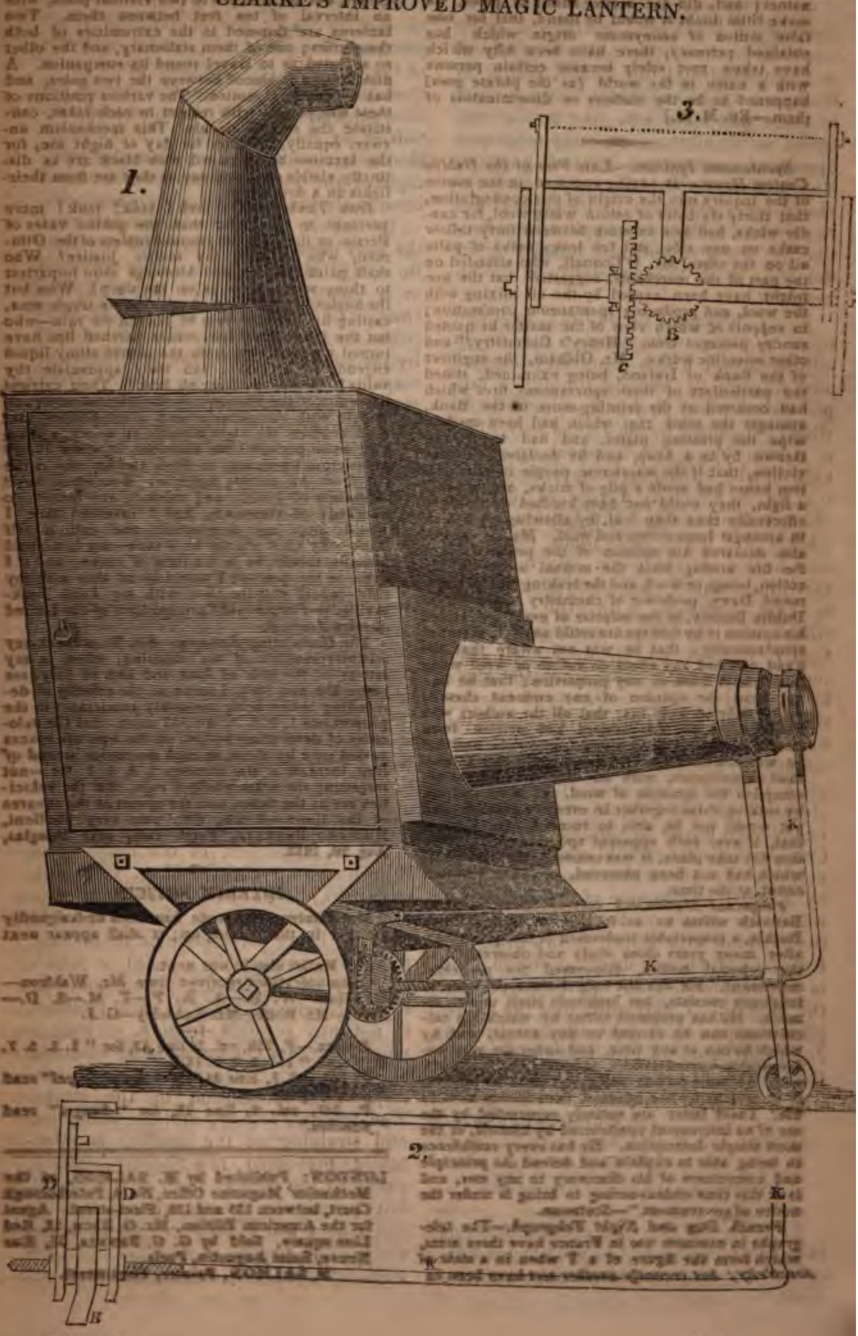
CLARKE'S IMPROVED MAGIC LANTERN.



CLARKE'S IMPROVED MAGIC LANTERN.

Sir,—The magic lantern, though so capable of combining instruction with amusement, has been hitherto confined to (comparatively) few hands, owing to its being an inconvenient thing to use, to those who have not, like public lecturers or exhibitors, a supplementary apparatus constructed for the purpose. The writer of this believes he has obviated every objection to its general use in private circles, by an application effective yet simple, and not interfering in the least with the portability of the instrument.

Fig. 1 represents the lantern, mounted upon a stage with wheels; K K is an adjusting rod, which is moved backward and forward by passing through a tapped barrel wheel B, fig. 2, which barrel wheel (supported by the forked stay, D D) is driven by a crown wheel upon the axle of the carriage, as represented by c at fig. 3, which is a view of the machinery from behind the lantern. The wheels are made fast upon the axle, and milled on the edge. By means of this mechanism the conjugate focus is kept adjusted with the carriage wheel, and the object maintained beautifully distinct as it apparently approaches to and recedes from the spectator, until it appears remote in the horizon, when it gradually becomes indistinct, which is agreeable to the mode adopted by professors, as well as analogous to nature. Should the necessary elevation of the forepart of the lantern be objected to, as producing elongation, (which, however, would scarcely be perceived,) the effect may be counteracted by a slight inclination of the screen towards the lantern. To the principle of the barrel or tube wheel, shown at fig. 2, I would particularly direct attention, as it is applicable to many purposes besides the present. I may add, that the above plan is approved of and adopted by Mr. John Davis, optician, Cheltenham, in all the lanterns of his manufacture.

I am, Sir, yours, &c.

URIAH CLARKE.

Leicester, July 30, 1833.

LANKESTER'S IMPROVED SHALDERS' PUMP.

Sir,—In the various communications that have been made to your pages during the last nine or ten months, relative to Shalders' pumps, I have sought in vain for any thing like a plain statement of the merits or the demerits of those pumps as compared with others, whether of the common construction, or of more modern invention. The discussions on this subject have, for the most part, involved so much personal, and, as I think, irrelevant matter, that the principle of the pump seems never to have been fairly brought before your readers.

To me it has always appeared that the only question of interest to the public is, will Shalders' pump raise the same or a greater quantity of water in less time, with less labour, and at a less expense for wear and tear, as can be raised by the common pump, the conditions in respect to each being the same? From my own observations, and the concurrent testimony of those who are fully qualified to give an opinion, I really think this question may be answered in the affirmative.

It would verge on folly in any one to deny, that Shalders' pump involves the same principle of action as Martin's pump, patented in 1766. That Martin's pump was ineffective is sufficiently apparent from the neglect into which it has fallen, and to which it rapidly tended, even during the lifetime of the proprietor. But although Shalders' pump involves the same principle as Martin's, it differs very materially in its application. Herein consists the superiority of the former, not only to the patent pump of 1766, but to almost every other pump, whether ancient or modern.

By an inspection of the drawing of Martin's pump (Mech. Mag. vol. xviii. page 136,) it will be seen that the sides of the barrel in which the upper valve worked, being perpendicular to its axis, there was necessarily a point at which the folds of the leather piston would be forced so closely together as to produce, if not any sensible friction, at least a most injurious collapsing and straining of the material, accompanied by a corresponding diminution of the stroke. The friction, if any, and the collapsing and straining of the leather, is effectually prevented in Shalders' pump, partly by the conical form of the barrel, but principally by the deep metallic rim called the expressor. The folds of the flexible piston, as they fall upon the working valve-box, or expressor, are ac-

commodated to the calibre of the barrel, the piston thus working freely and without any straining, by contact or pressure, throughout the entire progress, both of the ascending and descending strokes. I fully agree with Mr. Baddeley in saying, that the arrangement above described constitutes the chief point of distinction between Shalders' and Martin's pump. They are, however, exceedingly important, and we are indebted to Shalders for them. I cannot find in Martin's tract, "On the Principles of Pump Work," the slightest allusion either to the conical form of the barrel, or of the flexible piston, or to the metallic rim denominated the expressor. Whether these distinctions are, in themselves, sufficient to sustain the patent right, it is beside my purpose here to inquire. I believe it would be found more difficult to vitiate the patent than Mr. Baddeley seems to imagine. Many patents have been granted, and their validity has remained unimpeached, although they were for improvements on some prior patented invention. Some of these were of less moment, and deviated less from the original idea than in the case before us. I cannot comprehend Mr. Baddeley's views on this subject. It occurs to me, that whatever of *manliness* * there may be evinced in pirating Shalders' invention, there would, at the same time, be no inconsiderable share of *dishonesty* exhibited.

The unfitness of Shalders' pump for the purposes of a fire-engine is very justly noticed by Mr. Baddeley. This unfitness, however, is entirely accidental, not arising from any inherent defect in the principle, but in the materials. Could an engine thus constructed be kept in constant use I should say otherwise. The more substantial and indestructible the working parts of a fire-engine, the greater certainty is there that they will be found in working order when suddenly put in requisition. It would not be wise to trust the safety of a town or village to a few pieces of dry and neglected leather.

I am fully aware that Mr. Shalders, and his agent, Mr. Beare, have both said a great deal more about the "gravitating expressing fountains" than can either be justified or commended. Still, if the matter be stripped of the tinsel trappings in which it has hitherto been so carefully enveloped, I have no fears but something really good will be found underneath. Casting aside, therefore, all the bombast and unintelligible jargon employed by the patentee and his agent, I wish now to say a few words on the practical advantages of Shalders' pump as I have seen it, and as it is now manufactured at Southampton by Messrs. W. and J. Lankester, the proprietors of the patent for the counties of Hants and Dorset.

Happening to be at Poole, in Dorsetshire, about four months since, Shalders' pumps were incidentally mentioned in the presence of a gentleman (John Bown, Esq.) who, I afterwards found, had taken considerable interest in their employment, from a conviction of their superiority. Mr. Brown was the first person that purchased the pumps in that part of the country. Being a shipowner, he caused a patent pump to be fixed in each of three of his own vessels, and, with a view to ascertain their merits by patient and diligent comparison, he had also, in every instance, a common ship's pump placed by the side of the patent pump. In a letter written by Mr. Brown, May 10, 1832, a copy of which is before me, he says—

"I was told that they (Shalders' pumps) would raise about double the quantity of water with the same power, or, what comes to the same thing, one man would pump as much water with the fountain pump as two men could do with the common ship's pump: I have tried the pumps in three vessels for twelve months, and find the representations made to me to be true. This saving of power, or of time, does not constitute the only recommendation of these pumps. They will deliver sand, gravel, chips, &c., without injury, and without choking. Nautical men only are likely to estimate this property in proportion to its importance. Again, they admit of an exertion of strength from that of a child to that of two able seamen, and deliver water in exact proportion to the degree of exertion."

Perhaps it may be said, that it is unfair to compare these pumps with ships' pumps, inasmuch that the latter are generally of the very worst description, both in their principle and in their construction. In the case above mentioned the pumps on board Mr. Brown's vessels

* *Mech. Mag.*, vol. xix. p. 87.

were not of the very worst description, nor were they at any time either injured or neglected for the mere sake of experiment. They were ships' pumps, but quite as good in principle, and kept in quite as good repair, as such pumps usually are.

Shalders' pump is equally available for long lifts—within moderate limits—as for short ones. There is abundance of evidence to prove that in every situation where a common lifting or forcing pump is applicable, there may the patent pump be employed with a decided advantage, as respects both the quantity of water raised and the amount of labour required. For ordinary lifts it is, however, only fair to state, that the first cost of the patent pump exceeds that of the common construction. A gentleman at Twyford, in writing to Messrs. Lankester, says—

"The fountain pump you fixed in my well six months ago* answers in every respect admirably. It raises at each stroke double the quantity of water to what the old one did, and with much less labour. The lift (I believe you call it) is 78 feet."

It cannot be expected that persons will take down an effective pump to give place to one of Shalders', merely for the novelty of its construction. When a new pump is fixed in the place of an old one it is generally implied that the latter was no longer fit for service. Now, supposing the old pump at Twyford to have been a very bad one, and that for some time prior to its removal it had been in a very ineffective condition; yet may we not fairly estimate that some portion of the difference of water raised, or of labour employed, was due to the principle of the patent pump? Or must we believe that it was entirely due to the defective state of the old pump?

Another advantage in Shalders' pump is the facilities it offers for taking to pieces. That which I examined at Poole seemed the very perfection of an hydraulic machine for raising water in large quantities, with the least possible labour and wear and tear of materials. During the present month I have seen another of these pumps: it confirms, in every respect, all that has been previously said. The whole of the working gear was disconnected in my presence, and the water let out of the barrel; the gear was reconnected, and the pump in full action, and all accomplished in less than two minutes. I understand that a pump in daily use, and delivering 1¼ gallon of water per stroke, may be kept in good repair at a cost of less than 5*s*. per annum.

It would be very desirable that a series of experiments were instituted, so that the comparative merits of pumps of various descriptions may be satisfactorily ascertained. On the 15th of October, 1832, Mr. Mallet, in a letter to you, intimated that he had in view an enlarged and accurate train of experiments on the mechanical advantages or disadvantages of Shalders' pumps. Do you know, Sir, if he has ever executed them?

In all that I have said I wish it to be understood, that my only concern is that I may be a humble assistant in the search after truth. That Shalders' pump is good in its principle, who will deny? If there have been, and still continue, defects in the mode of its construction, let them be remedied. Those who find fault should point out the defects.

The remarks I have offered apply only to the pumps manufactured at Southampton. I have never seen one of Mr. Shalders' or of Mr. Beare's "real originals;" but from the drawings and descriptions in their "Prospectus," and in the "Repertory of Patent Inventions," for September, 1826, I believe I may with safety affirm, that whilst in Messrs. Lankester's pumps the principle is undoubtedly the same as in Shalders', yet so numerous and important are the subordinate improvements those gentlemen have made in their pumps, that Mr. Shalders himself would find some difficulty in recognising in them his own patented invention.

I have been very sparing, Sir, in the use of the testimonials I have in my possession, because I feel reluctant to occupy your pages with such matters. The following I select for their brevity:—

Mr. Richard Arnold, commander of the ship "Procris," in a letter to Messrs. Lankester, dated July 16, 1832, says:—

"I beg to inform you, that the patent fountain pump, fixed in March, 1831, on board the 'Procris,' 391 tons, under my command, acts admirably, and I do not think it can be improved. It has now been in constant use during three voyages

* *Now fifteen months*; and it has not cost one *penny since it was completed*.

between Canada and Poole, and during the latter voyage the ship made a great deal of water, which was pumped out with *one-third* the labour of the wood pump alongside of it. In fact, the sailors considered it almost a pleasure to work at it *, and if occasion required them to work the wood pump, when on the lee side, they considered it a punishment. I am quite sure every owner and master of a vessel will consult their interests in immediately adopting the fountain pumps."

Mr. Thomas Blake, Medina Brewery, Cowes, Isle of Wight, June 14, 1833, writes:—

"I have to express my satisfaction with the set of patent fountain pumps you fixed in my new brewery, and which I believe to be more effective than any I ever saw in use. The average height from the surface of the water in the well to the cistern is about 46 feet, and the horse, at an easy pace, raises about one hogshead per minute. You are at liberty to refer any person to me for information as to the superiority over the common pumps. The saving both of time and labour is very considerable.

If we are all deceived about this said "gravitating expressing fountain" of Mr. Shalders, the sooner the veil is taken from our eyes the better will it please your truly faithful servant,

J. O. N. Rutter.

Lymington, Hants, July 27, 1833.

P. S.—Almost every word of the above letter was written more than a month ago. I mention this because, as I know nothing of Mr. Shalders excepting by his published correspondence, I wish it should not be inferred that I have been influenced in any way by his letter in the Magazine of July 20.

* One would think that Mr. Shalders had been on board the "*Procris*," for in his last letter, *page 206, he calls it "pumping made easy."*

THE CASE OF THE POOR WORKING COLLIERS.

Sir,—I happen to be one of those persons who never consider time or trouble of importance, so that the minds of the working classes obtain benefit. I regard all science as useful only so far as society is benefited thereby. It need not surprise you, therefore, that I feel disappointed at not finding the *grand assembly of philosophers* uniting all their efforts to accomplish some great object, immediately conducive to the public good. On attentively examining the several subjects brought before the late meeting at Oxford, I do not find that any one of them had for its object the improvement of the arts of life. And yet what could have better suited such a national association, than an inquiry into the best methods of conducting those staple manufactures, on the perfection of economy in which depends our ability to compete with foreign countries? Or an exposition of the means of rendering more useful to society, and more comfortable in their domestic circumstances, the artisans who produce all the wealth of the country?*

We hear frequently of the plaudits given to individual efforts for benefiting individuals. Similar plaudits would be certain to any efforts for general benefit. And, so long as whole classes of the community may be rendered more comfortable by the resolute interference of scientific men, there cannot be a more suitable subject for the proper employment of their time. Let us take one class at a time, and endeavour to draw their attention, as well as that of the public, to the inconveniences to which it is subjected. I am not going into politics any way; therefore, need not frighten your more timid readers.

One of your correspondents, in a recent Number of the Magazine (Feb. 1833), mentions the manner of obtaining coals from the mine. Now, Sir, what is the condition of the great majority of our working colliers? I allude in a particular manner to those of the northern mines, in which this industrious and useful class exist in an atmosphere of fire-damp, guarded from injury merely by a gauze lamp; and, from the consciousness of possible if not immediate danger, are unable to accomplish the full amount of labour they would effect in a place of security. Does not the consideration of their condition demand the attention of all intelligent men? And may not the investigations of our grand assembly be most usefully directed to the complete prevention of those awful disasters (of which all of us hear, but of which few have an adequate idea); and this on two

* The similarity between these remarks and a passage in the review of the proceedings of the British Association (p. 310-11), makes it proper to state that neither of the writers of these papers could have been aware of the sentiments of the other on this head.—Ed. M. M.

accounts—one, the vast sacrifice of human life; the other, a regard to public economy? I wish to place the subject fairly before the public, from a conviction that it is of national interest: it involves deeply the basis of our trade and manufactures; and if not speedily allowed a due degree of attention, two-thirds of the coals in the nation will be either lost to posterity, or will be hereafter obtained only at such a risk as will greatly enhance their price, if not place them beyond the general reach of the people. All calculations, in reference to the durable supply, will be useless, when the danger of quarrying surpasses the cupidity of the collier. (See Buddle's Report to the Society for Preventing Accidents in Coal Mines at Sunderland and Newcastle.) How the supply will be obtained by the diluting system from the estuaries of the several parts, by even the most daring men, we have yet to learn; for at present the method generally adopted will not avail for scarcely a mile in extent. I happen to possess the Report of the Lords' Committee on the Coal Trade, for 1829-30, and only wish it were more generally known. If those who have access to it would but read the evidence of Mr. Buddle and Mr. Brandling, they would be astonished at the inevitable consequences of things remaining as at present conducted.

I wish the public to understand, that in obtaining coal from the mines there are two systems known, and that ventilation of the mines is a necessary and indispensable part of each system. Had your correspondent fully detailed all the particulars of that to which he alludes, as practised in the Durham mines, I should have been saved some trouble; but as he has omitted very important—indeed, the most important—facts, your readers and the public will not censure me for stating them.

The two systems I have mentioned have for their authors two directors of mines, named Buddle and Ryan, and are wholly opposed in principle. Since the introduction of that of the latter, or the new system, in the period of twenty-five years, some thousands of lives have been lost by explosions in mines conducted on Buddle's system, and not one single life in any of those conducted on Ryan's, although in operation where, formerly, *the number of explosions* were more *than one hundred to one* in all the other mines put together. According to the system adopted by Buddle, (which, in fact, is the old method, that has been practised from time immemorial—only a little modified,) the first operation is to cut out roads or passages of four yards wide in one direction, then to take out one-third of the coal, and leave two-thirds remaining in pillars. For the purpose of my argument, and its illustration, I will take a square mile of coal-field. The first working of this extent by Buddle's system, will produce one hundred and forty-seven miles long of that sort of passage I have mentioned, four yards wide, which, by cross cuts at each side, reduces the coal to slack, that passes through the riddle, and is a great loss to the proprietors. To the workman is given such a price extra as will remunerate him for cross-cutting as much as he holes under the coal raised out of this sort of labyrinth, and also for bringing the slack to the surface. This system also requires the cutting of another intersection, only 2 yards wide, and about 15 apart, making 117 miles of this sort of passage, and for which passages 2*s.* per yard forward extra is paid the men, amounting to the round sum of 20,540*l.*; although the coal got out of these passages is of little value, because cut to slack. When a passage is cut at each side, as often there is, it adds an extent of 117 miles, making all the passages together 234 miles.

Along these extended and intersected passages the ventilating current has to pass and sweep away the carburetted hydrogen gas as it issues from the backs, blowers, &c. There are openings made into the rib of coal, which are arranged so that it is made into 12,000 pillars; and there are also some miles of board bratising used, that the current may be carried along the boards or headways. Now, with all this trouble, and inseparably connected expense, Messrs. Brandling and Buddle, in their evidence, state, that they get only one-third of the total mass of the coal field, of which (from the method of working) a third is made into slack, that passes through the riddle, and is lost to the public for ever. They also state, that the expense per chaldron amounts to 7*s.* 10*d.* Now, what becomes of the two-thirds of coal left? Why, it is removed in returning along the works, although, from being left exposed for years, it has suffered much dilapidation

as well as deterioration in quality. But Messrs. Brandling and Buddle state, that the expense of getting the pillars is 21*s.* per chaldron=colliers' two tons. I cannot help considering the first price, 7*s.* 10¼*d.*, extremely high: it would be so considered, at least, in a Staffordshire freed colliery; and, indeed, it is such as is not given at present. What, then, are we to think of 21*s.* per chaldron, nearly three times as much, and this although the mine is ready supplied with rails, &c. Now, as two-thirds of the supply from the mines must consist necessarily of coal worked at this high rate, it follows that the loss hence arising to the City of London alone cannot be less than *the enormous sum of* 1,050,000*l. per annum*, arising solely through the absence in the mines of a proper and efficient system of ventilation. Is not this a tax of which the metropolitans are little, if at all, aware? And as it costs this sum to London, allow me to ask what does it cost the parishes in Northumberland and Durham through explosions, and disorders of the colliers caused by inhaling the gas, &c.? I have been informed that the late explosion at Wallsend mine (particularly under the direction of Mr. Buddle), where 52 men perished, left about 200 dependants on the parishes. Now, were they allowed, weekly, one shilling each, the expense to the parishes will amount to 520*l.* per annum; and as this expense will continue, on the average, 10 years, it makes 5,200*l.*; and this without taking into the account the pauperisation of all parties, and demoralisation of the children from the loss of parental care. This is only a small explosion, be it understood. I am not here adverting to what expenses must be consequent on such as that at Felling (the mine under the direction of Mr. George Hill), where 94 were destroyed at one time, and 36 more in less than a year; nor the other at Wallsend, 50; nor that at Stalla, 76; nor that at Newbottle, 84; nor the recent one at Springfield, 47. Even while I am writing, I hear it announced, that an explosion has occurred in the Lambton pit; only *two* perished, certainly—for Providence had allowed most of the men to be at home, and only those who had to repair the roads were left; but had *two thousand* been present, their fate would have been equally inevitable. Nor do I refer to Hebburn (*the colliery Buddle told Ryan was too* much for himself to cure, and in which *several hundreds* have perished); although Ryan, when told this in the presence of Anthony Clapham, offered to clear it in a week; neither do I refer to Sheriff's Hill, 100; Marquis's Pits, several hundreds. I will leave others to make the calculations of these expenses, not from want of inclination, but of time; though perhaps hereafter I may supply it if no other correspondent should.

Do not these facts shew an absolute necessity for a change? The new method of raising coal, introduced by Ryan, is asserted to prevent completely explosion in any coal mine whatever. At any rate the Society of Arts gave him credit for such an assertion, for they conferred on him *their highest premium.* On that occasion he acted with great and firm independence, for, after there had been voted 50*l.* to him, on being told that Viewers had arrived from the north to oppose him, and that if he had then to seek the reward his expectation would be disappointed, I myself then heard him say, "Then re-commit the business; I am ready to try the matter again." The business was accordingly again investigated, and I saw him stand the test of inquiry one night in each week for ten weeks. Are all other men, except Buddle and Ryan, fools, or unable to calculate and understand a simple science? If so, then where are the boasted attainments of our philosophers? I forbear. We all have as much common sense as either of the two, and are all able to reason as closely. We have to deal however with the systems, not the men, and their relative merits or demerits are objects of our notice.

From the account in the Society's Transactions, Ryan's system of working and ventilating mines appears very simple and efficient. It is founded on this proposition:—"Where there is no dislocation of the backs of the coal, there will not be any confined hydrogen; but wherever there is such a dislocation, remove the cause and the effects will cease." A truly plain remark; but, as a dislocation is not so easily removed as talked of, how does Ryan's system avail for the purpose? I will again assume a mile area of coal-field, with *two* faults or dislocations running the whole extent, and dangerously dislocating the backs. Ryan's method will require eight roads, the whole extent of the field, to convey the

coals to the pits up which they are drawn. These are made like the *boards* of the Durham and Tyne mines, and at similar expense, and rails extend along them, as needed by the workings.

Along each of the two faults is cut a passage in advance, into which the gas will evolve; and when these are completed, then the air in one (usually sufficient) is highly rarefied, and the other becomes useful as a road for the coal. The expense of making these two passages, on the same rate as those already mentioned (2*s.* per yard onward), will be 176*l.*; but no roads are made on the ends of the coal. The extent, however great, is altogether out of the question, for the system is not in the least affected by it, as 1 or 20 miles can be worked. When these passages are formed to the proposed extent, the gas-head passage needs only to be of adequate size, and (whatever the area of the mine) the gas by its levity will flow into the rarefied avenue, and the greater the accumulation of gas, the more rapid will be its evolution into the gas-head, where the increased rarefaction will promote the velocity of its ascent into the air. And as this repository of the gas is constantly closed, so as to prevent the men entering therein, the possibility of burning them by the gas is completely superseded.

These indispensable arrangements being completed, the most economical working of the mine may be pursued. The roads being already formed, to open the works for such an extent as may be necessary to supply the demand must be attended to. Suppose the seam were a 6 feet coal, and 1100 yards were the extent, the men are to be put to make a corf under, from back to back, and then the mass is thrown down by gunpowder, and is in the form of long blocks of coal, 210 yards each. As one collier corfs under 8 or 10 yards, ten would do so under 100, and thus the entire mass of coal is got at one operation, without any cross-cutting at all, while, in the old system, in a 6 feet coal, the collier, working in a board, or passage, of 4 yards wide, after he holes or makes a corf of a yard in, has to make two cross cuts of 4 yards, which are so much labour and coal thrown away; for in getting out the two yards he has to cross-cut as much as to get out the four yards.

Mr. Brandling, in his evidence before *the Lords*, *proves*, that the taking away the gas from the mine (or ventilating it), alone costs no less a sum per chaldron, than *thirteen shillings and twopence*. Now as, when the roads are once made, any collier can get the pillars with less labour, and therefore should do it cheaper than the first *one-third* was quarried for; and as the pillars could be got at much less (at least one-third that expense) in all non-explosive collieries in Britain, how the expense is enhanced from 7*s.* 10½*d* to 21*s.*, needs to be fully and correctly understood.

Suppose we attentively consider the matter in reference to Wallsend mine, whence the data are formed, as having roads to the extent of a mile, producing one-third of the coal, and leaving pillars, and cutting passages, and all this labour for, say, only 7*s.* 10½*d.*; I shall now be prepared to shew that, owing to the defectiveness of the system to prevent the gas intermixing with the atmosphere of the mine, the working in this state costs almost *three times* that sum, while the coal obtained is of deteriorated quality, and has suffered waste by time and effect of the gas. For, if we believe Buddle's own account, he pretended to try to clear explosive mines in 1806, and failed; and in most of the principal mines, as well as Wallsend, no candle has entered for eighteen years.

Now, wherever gas evolves in a mine, the conclusion of Ryan is, that its passage to the surface is stopped at some higher part of the strata by some fault or dislocation; and our business then would be to ascertain how the direction and the number of such dislocations affected the gas. If they occur less frequently than once in seven yards, Ryan's system would prove most economical. And what geologist will assume that the average number of faults across the strongest part of the strata is even *one* in a space of two miles, though quarries show frequent instances of *slips of the face*?

In a six feet coal, the average quantity is 9,000 chaldrons of coal per acre, all of which will be quarried by Ryan's system, and the slack made would be all useful for the engines; while, on all the difference in quantity of coal thus prevented becoming slack (as by Buddle's system), the mine master would derive 17*s.* per chaldron (on probably 300 chaldrons more per acre) of large coal.

Messrs. Brandling and Buddle say their expenses exceed their returns,

may be admitted, if we assume a tion something like this:—

t working, 150 chaldrons, at 8s.	£60
nd ditto pillars, 200 ditto—21s.	210
	270
it mouth, 350 ditto ......—18s.	310
To pay Royalty, &c.	40

what would be the returns on the ystem?

'00 chaldrons .... at 18s.	630
00 ditto large coal...... — 5s.	175
To pay Royalty, &c.	£455

suppose this latter method cost the expense of the other, yet as ipplies only a third at 7s. $10\frac{1}{4}d.$, e other two-thirds at 21s., the loss ss-cuts and ways more than ba- the difference of the accounts.

matter is this—either the loss of explosions is a subject of mere :ence to the community, and which to be proved by the supporters dvocates of the *diluting* system, :, Hill, Hodgson, and others; or *vaste of life*, which can and should vented, as avowed by the mine s of Dudley and its neighbourhood, they, in 1818, told those of the nd Wear, that *the Report of their ttee was entirely without foundation.* interests of society, as well as of ity, are involved deeply in the s. Then why should not a full gation be now instituted, before a tion of intelligent and conscien- nen, either in London or at Dud- id then determine which system is t?

I am, Sir,
Your obedient servant,
HUMANITAS.

E COMPARATIVE AMOUNT OF FRIC- I ON A LEVEL AND AN UNDULA- RAILWAY. BY S. Y.

—I believe it is pretty well under- y engineers that, in transporting ige from one end of a railway to er, we have three obstacles to over- 1. The inertia of the body; 2. ction of the moving parts; and, 3, sistance of the air. When the ulti- nd uniform velocity is attained, we vercome the first obstacle, and it no further resistance until we alter ed: the second and third oppose forts during the whole time the *e is in motion*; but as the undu- lating railway is not supposed to lessen the resistance of the atmosphere, we shall not again allude to it.

The inertia may be overcome, and the ultimate velocity imparted to the carriage in various ways. It may be done by the locomotive engine as is done at present; or by the assistance of some auxiliary force; or by allowing the carriage to descend an inclined plane or curve: but in any case we must depend on our loco- motive engine for *maintaining* the velo- city we have imparted; and to ensure this, the engine must be sufficiently power- ful, and have sufficient hold on the rails, to enable it to travel at the ultimate velo- city we have imparted to it, and exert such a tractive force upon the carriage as the friction renders necessary. Therefore, in all cases where the amount of friction is the same, the amount of power ex- pended must be the same, let the velo- city be attained how it may. And as we cannot change the velocity of a body without expending power of some kind, to change the velocity of a body from slow to fast, and from fast to slow, as is done on the undulating railway, is to expend power to no useful purpose where transition is the ultimate object.

The locomotive engine produces an accelerated velocity, until, by increased velocity in the body moved, the resistance caused by friction, &c., becomes equal to the power, when the motion of course be- comes uniform. When the carriages are descending inclined planes they are kept at a moderate velocity by means of *brakes*, or contrivances for increasing the friction of the moving parts, by the action of which all acceleration is prevented. This appears to me a sufficient proof that the usual accelerating effect of gravity may be counteracted by friction, and the motion become uniform although gravity be the mover.

Mr. Badnall says "the friction on the road decreases as the velocity increases: hence, though a constant power were at disposal, its effective employment would be diminished for want of fulcrum, when the velocity was very great." I answer the curve will not obviate this difficulty, but rather increase it; for the velocity must be greatest on the curve, while the pressure will be in the same proportion to the pressure on the level that the friction is in to the friction on the level.

All Mr. Badnall's calculations are purely theoretical; he supposes friction

provided for by his moving powers, and troubles himself no further about it. Now, I apprehend the public are not concerned about what *may* be done, if such and such conditions can be fulfilled: all they want to know is, whether the new mode of transport is more economical, or in what respect it is better than the old mode; and therefore it would perhaps have been as well if Mr. B. had treated the matter a little more practically, and taken the trouble to ascertain the amount of friction in both cases, and also seriously considered whether it were possible to provide himself with such a constantly varying power as his railway will require. But Mr. B. seems to consider that the same engine that will move a carriage at the rate of ten miles an hour will move it at the rate of fifty, provided it is once fairly started at that speed.

I perceive Mr. Badnall does not intend again *replying to anonymous correspondents.* As far as I am concerned, I beg of that gentleman to study nothing but his own convenience.

I am, Sir, yours, &c.
S. Y., an Engineer.

July 23.

REPLY BY THE SAME TO MR. BADNALL'S LETTER OF THE 10TH OF JULY. (SEE LAST NUMBER, p. 345.)

Sir,—Although I do not deem it necessary to occupy your valuable space by answering every thing an opponent may choose to advance, I think gross miscalculations ought to be corrected as speedily as possible.

In 1825, Dr. Olinthus Gregory published a little work called *Mathematics for Practical Men;* on page 238 of which I find it stated that "the velocities acquired by bodies in falling down inclined planes of the same height are all equal, estimated in their respective directions;" and it is well known that the velocity acquired is the same as if the body had fallen freely through a space equal to the height of the inclined plane. On page 236, the Doctor says, "$V = 8\sqrt{S}$" where $V =$ velocity in feet per second, and $S =$ space in feet fallen through. Applying this simple formula to Mr. Ham's inclined planes, page 179, I find the velocity acquired by the body at the bottom of the first inclined plane will be 32.16 feet per second; at the bottom of the second, 45.36 feet per second; and at the bottom of the third, 55.00 feet per second, within a fraction.

It is obvious that if a body moves through any given space with a uniformly accelerated motion, beginning with a velocity A, and ending with a velocity B, it will occupy the same time as if had moved with a uniform velocity $= \frac{A+B}{2}$ and, therefore, Mr. Ham's first half mile will be traversed in the same time as if the velocity had been uniformly 16 ft. 1 in. per second, from beginning to end; the second half mile is traversed at the rate of 32 ft. 2 in. per second; and, according to my calculation, the times they will each occupy will be—

1st	half mile	164.1 seconds
2d	....	82.0
3d	....	68.1
4th	....	58.2
5th	....	52.6
6th	....	48.0
	Total	473.0 seconds

occupied in traversing the whole three miles, instead of $61\frac{1}{11}$ as Mr. Badnall, by some "inexplicable calculation," makes out at page 346. Indeed, if the 3 miles were traversed at the greatest acquired velocity, viz. 55 feet per second, 288 seconds would be required for the journey. Really, when a gentleman makes up his mind to be "*perfectly unceremonious,*" and calls on public companies to suspend their proceedings until he has convinced himself of his error, he ought to pay a little attention to his arithmetic.

Perhaps Mr. Badnall might have gained as much credit by fairly discussing my paper, as he has acquired by his efforts to turn it into ridicule, and by declaring he "*cannot possibly understand it,*" when there is nothing to prevent his understanding it, but the very excusable error of the press, which substituted 8 for .8; but of this Mr. B. is doubtless the best judge.

Yours, &c., &c.,
S. Y., an Engineer.

August 17.

Since sending you the above, I have read your 524th No. I will therefore just observe that Mr. Badnall seems to me to mean that if friction is provided for or annihilated, a carriage may be transferred from one end of a curve to another, without the aid of any other

g force than gravity: while, on a railway, gravity alone could not motion. I admit the truth of this; say, as you cannot annihilate fric- and as it is friction alone which mes the locomotive power after the s once in uniform motion, the com- ve amount of friction in the two is all we need consider. I will nention *atmosphere*, lest any good hould dream I have forgotten its nce; and must submit that, al- h at high velocities, it is doubtless incipal cause of rendering the mo- niform, it is not a remark which is t in all cases.

S. Y.

RKS BY MR. HAM ON THE SOLUTION OF HIS PROBLEM. (p. 179.)

.—I do not acknowledge that your pondent S. Y. has given any solu- my problem in page 179, nor am osed to "take his word" on the t of undulating roads, as I fancy am just as good a judge of it as lf.

ne of your correspondents having pted it, I suppose I must solve the m myself.

s well known to mathematicians, that all falling bodies (whether perpendicularly or on inclined planes), *freed from friction*, will acquire a velocity, at the end of a descent of 16 feet 1 inch, of of 386 inches per second; at the end of a descent of 32 feet 2 inches, of 772 inches per second; and at the end of 48 feet 3 inches, of 1158 inches per second. Then, of course, the mean velocity on the first mile of the regularly inclined plane of the diagram (which see), must be $\left(\frac{386}{2}\right)=193$, the mean velocity on the second mile $\left(\frac{772-386}{2}+386\right)=579$ and that of the third $\left(\frac{1158-772}{2}+772\right)$ $=956$ inches per second.

The mean velocity on the first, third, and fifth half-mile of the alternating plane is, of course, the same as on the first, second, and third mile on the other respectively, the descents being equal; and the regular velocity on the alternating dead levels is the velocity of the carriage when it first enters them—that is, 386, 772, and 1158 inches per second respectively.

The calculation is now simple enough. The carriage runs

	On the Regular Plane.	*On the Alternating Plane.*	
The first mile in	328 seconds	164″ in the	first half mile
		82	second
		55	third
second . .	109	41	fourth
		33	fifth
third . . .	66	27	sixth
	503″	402″	
Deduct .	402″		
	101″		

t the carriage will arrive on the ating road at the point B in 101 ing fractions) sooner than on the rly inclined plane.

ould have exhibited this solution ondensed form, algebraically, but t would not have been so popular. I now to shew what "this has to with undulating railroads.

pose the *level* line in the diagram, 179, to be a railroad. Immediately uous to it suppose another, formed vating the third half-mile in the ating road in the diagram until it touches the level line, and so continue it for the three miles.

Thus an undulating road is formed, having a descent of 16 feet 1 inch in the first half mile, a dead level in the second, and a rise of 16 feet 1 inch in the third. Repeat the same for another mile and half, ending at the three mile point on the level road. I prefer a series of planes to curves, because it simplifies the calculation without affecting the principle.

Now, as before, a carriage is supposed having just sufficient locomotive power to destroy the effects of friction, but not

enough for progressive motion on a level. Let such carriage be placed at A, and its fore wheels just moved over the point of descent. The motion now commences, and it descends the first plane in 164″, and moves over the dead level in 82″, as already stated above. The ascent up the inclination is, for the same reasons, performed in the same time as the descent — 164″, making together 410″. The next undulation being precisely similar to the foregoing, and the carriage again starting under the same circumstances, the remaining mile and half is performed in exactly the same time; and the whole distance, three miles, in 820″, with a locomotive power which will not even move the carriage on a level.

In order to vary the proposition a little, we will now suppose the carriage receiving such a *single* impulse at A as will carry it three miles on the level railway in 820″. Now place it at the commencement of the undulating road, and give it there the same amount of impulse: it is plain that such impulse will just double the power of gravity, and carry the carriage to the same point in exactly half the time, or in 410″—a slight allowance being made for the difference of length between the straight and undulating road. You will observe that I have cautiously avoided touching on the practical objections to this mode of locomotion. Whether or not the piston of any engine can travel *effectively* fast enough in the cylinder to allow of that great velocity for short periods, without which undulating roads will be useless, is a question I leave to the engineers to decide.

If the theory and calculations I have here given be incorrect, I shall be glad to receive the demonstration. J. H.

Bristol, Aug. 12, 1833.

RECENT AMERICAN PATENTS.

[Selected from the Journal of the Franklin Institute.]

MANUFACTURE OF OAKUM FROM JUNK; *Ebenezer Cook, of Haddam, Connecticut.*—The patentee sets forth in his petition that he has invented a mode of softening the junk from which oakum is to be manufactured, which is very superior to that he[illegible] followed, which consists in [illegible] 32.16 feet [illegible]nd for a considerable [illegible] of the second, [illegible] containing hot water; that in the new process the water into which the junk is thrown is put into rapid motion, whereby the fibres of the junk are so far separated as to render the picking easy, and, at the same time, the oakum is of a very superior quality. The machinery ordinarily used by him consists of a cistern, or vat, resembling the vat of the beating machine used in paper making. In the place of the revolving cutters, or beaters, there is a paddle wheel, the revolution of which keeps the water and junk placed in the vat in constant motion. A furnace is so fixed at one end as to keep the water constantly heated, and the whole is covered to prevent evaporation. The claim is to the method or principle of making oakum, and preparing the junk for that purpose by *keeping it in motion or circulation in hot water*, in the manner hereinbefore described, or by different machinery, or in any other manner.

SEPARATION OF MAGNETIC ORES; *Joseph Goulding, of Reeseville, New York.*—The design of this machine is to employ magnets for the purpose of separating the available ore from the extraneous matter with which it is mixed. To effect this the ore must be pulverised before passing it through the machine. Those who are acquainted with the nature of ores will at once perceive that the apparatus spoken of cannot be applied to them indiscriminately, but to those only which are denominated magnetic. There is much iron ore, of excellent quality, which does not possess this property; and sometimes these and the magnetic ores are to be found in the same mine. In either of these cases the machine to be described cannot be usefully applied. A hollow cylinder is to be made, which, in the machine referred to in the specification, was about four feet long, and two feet eight inches in diameter. This cylinder has no gudgeons, but its periphery rests upon those of two cylindrical rollers, and motion being given to these the cylinder is also turned. It is lined throughout with short magnets, confined in their places by means described in the specification. The cylinder is a little inclined, like a bolting screen, and the pulverised ore being introduced at the elevated end, the refuse matter escapes at the other. In its passage, the magnetic ore adheres to the magnets, and from these it is swept off by a re-

volving brush, into a trough passing through the cylinder.

Grinding Cylinders perfectly Straight and True; *Jonathan Bridges.*—Steel and other cylinders are frequently ground perfectly true by fixing a stone, or other grinder, upon a shaft parallel to that of the cylinder, and causing it to traverse from end to end of the cylinder; a rotary motion, generally in opposite directions, being given to each. The shaft of the grinder is, in this case, made cylindrical, that it may slide within collars at either end of the machine. The shaft of the grinder must, necessarily, be at least double the length of the cylinder to be ground. The present invention is for an application of the same mode of grinding, but by machinery which is differently arranged. The shaft upon which the stone, or other grinder, is placed, does not traverse backward and forward, but the grinder itself slides from end to end of the shaft. The latter is made cylindrical, and is grooved from end to end, and a piece projecting from the hole in the grinder into the groove, prevents it from turning round upon it, and guides it as it traverses along. There are pullies placed upon the shaft of the cylinder to be ground, bands from which give motion to the grinder shaft. The apparatus which gives the traversing motion to the grinder would require an engraving for its perfect explanation. The claim is to the particular arrangement of the machinery by which this is effected. It is contemplated to apply this instrument to the grinding of cylinders of all kinds, whether of wood or metal, and particularly to piston shafts and card cylinders. In grinding cards it is observed that it may be fixed in the place of the doffer cylinder, and moved by means of a bolt from a pully on the main card cylinder shaft, its construction admitting of its being carried to the body to be ground.

Improved Clock; *James S. Seger, New York.*—This improved clock is not destined to take the place of chronometers, or of time-keepers made for astronomical purposes; we believe, however, that it possesses novelty, and, compared with clocks in general, it has great simplicity. A piece of board six inches square forms the foundation of the clock, and this it is proposed to hang on a nail in a wall, by a ring placed at one of its angles. Into the centre of this board a round steel pin is driven, which receives the pipe or barrel of a fling wheel, the diameter of which is nearly equal to that of the board. Just above the teeth of the fling wheel, another piece of steel is driven, which forms a knife edge suspension for the pendulum. This latter is a long bar, say of two feet, weighted at each end, and hung in a horizontal position upon the knife edge, like a scale beam; a part of the pendulum, on each side of the point of suspension, extends downwards, so as to form pallets acting on the teeth of the fling wheel, and thus constituting the escapement. The face, upon which the hours and minutes are marked, is a flat circular rim, which is merely hung upon the point of the swing wheel, and is furnished with teeth or notches, which must, we suppose, fall into corresponding teeth on the outside of the pipe, although we are not so informed in the specification. A second but smaller circular rim is also hung upon the same pipe, and has a projecting part upon it, which constitutes the hour hand. The size of the openings, and the number of the notches, on these suspended rims, must be so calculated as to correspond with the other parts of the machinery. A weight, acting on the pipe or barrel of the fling wheel, is the maintaining power. A fixed wire, extending from the centre pin to the knife edge, serves the purpose of a minute hand, as the suspended rim revolves beneath it.

Machinery for Cleaning Fur; *Charles Lockwood, and Ransom Lockwood, of Weston; and John Arnold, of Norwalk, Fairfield county, Connecticut.*—The object in view in this case is to separate the fur and hair from each other after they have been cut from the pelt. A machine is described, which the patentees say they have had in use with beneficial results, and they indicate different modes in which the same principle may be applied, resting their claim upon the principle of action whether applied as they have done it, or in any analogous way, which produces the same effect. The invention is founded on the principle that barbs, or asperities, contained on hair, give to it a tendency when agitated to travel back in such a way as will cause it to enter between the fibres of any kind of cloth, and to pass through it, a princi-

ple indeed upon which the process of felting is entirely dependent. The machine which the patentees use is an oblong box, supported on a suitable frame; the sides of the box are lined with tin, or otherwise so made that the fur will not adhere to it, whilst the bottom is made of cloth, into which the hairs are to be forced to pass. Within this box revolve a number of whippers, attached to shafts, which serve to agitate the fur, keep it hollow, and prevent it felting. The machinery by which the shafts are turned, operates also upon the cloth bottom by a twitching motion, alternately relaxing and straining it, which causes the hairs to enter and pass through it. It is proposed sometimes to send the fur through a revolving machine, formed like the boulter of a flour mill, and covered with cloth, having whippers revolving in it, and beaters acting on the outside of it, in order to produce a result analogous to that obtained by the twitching motion before spoken of. Other modes are pointed out, all of which are considered as mere examples of the many forms which may be given to the apparatus whilst it remains essentially the same, the claim being to "the agitating in any manner, the mixed mass of fur and hair, and causing their separation by the inherent and natural qualities of the hair, when thus agitated in contact with cloth."

Glass Hones for Razors; *A. Gordon, and John P. Bakewell, Pittsburgh.*—Such a form is to be given to rods of glass as may be deemed best, a convex surface, however, being preferable to a flat one. The faces of the glass hone are "to be rough-ground or frosted by any of the usual means, and a grain differing in fineness may be given to the respective sides." Upon the glass hone, so prepared, the razor is to be rubbed in the usual way, the hone being first moistened with water or oil. The claim is to the application of a new material, glass, to the making of hones. A slight trial, upon a roughened glass tube, afforded us a very favourable result.

Clarifying Sperm and other Oils; *Ephraim C. Moss, of New York.*—The agent for clarifying oils of various kinds is heat, applied through the medium of steam, or boiling water, in any suitable apparatus. The oil is to be put into a tin kettle, which fits into a copper or other boiler, by which it may be surrounded with boiling water or steam. A close cover is to be fitted on to a tin kettle, and openings made for supplying water and oil, and also for the placing a safety valve. Oil kept at a moderate heat in this way, will, it is said, be clarified in a few hours, a portion of the foreign matter rising in scum, and another portion precipitating. During the process, the rising scum is to be removed. The patentee states, that one great advantage of his procedure is, that it can be followed at all times and seasons, whilst the refining of oil by exposure to air, and the direct rays of the sun, is restricted to fine weather, and a limited portion of the year. This process admits the use of caustic ley, sometimes employed, in which case the ley is to be thoroughly mixed with oil before the heat is applied.

STATE OF MANUFACTURES IN AMERICA.

(From the Factory Commissioners' Report.)

Evidence of Mr. James Kempson, of Philadelphia, Cotton Manufacturer.

With what extent of manufactures have you been conversant in America?—I have been acquainted with the manner of conducting manufactures in most of the manufacturing states.

What number of workmen do you employ in your manufactory?—About four hundred.

What is the lowest age of persons in your employment?—None under nine.

Have you many about nine years of age?—We have a great many between nine and twelve. About one-fifteenth of the persons employed in the United States are under twelve years of age.

What is the utmost extent of your daily working hours?—The actual number of working hours averages throughout the year twelve hours of actual work; at some seasons it is nearly fourteen, and at others it is little more than ten.

Is the labour for fourteen hours often continuous for many successive days?—We change the period by the light. We never light up in the mornings, nor in the evenings, from the 20th of March to the 20th of September; and from the 20th of September to the 20th of March following, we work until eight o'clock of the evening.

Do the children work during the whole hours of work?—Yes; we never make any difference on account of age.

Have any complaints been made in the United States as to the propriety of such

of labour for children?—There een newspaper complaints, originat-bably from the workmen who came his country to the United States; iong our workmen there is no de-have the hours of labour shortened, hey see that it will necessarily be ianied by a reduction of their

t proportion of the persons em-are natives of the United States?—thout New England, which are con-the manufacturing states, above enths of the persons employed are of the United States.

many of the remaining two-tenths h workmen?—The greater portion n; but, as a general rule, they do e to take English workmen in the ngland factories.

do they not like the English en?—Because they are so dissi-and so discontented.

his their general character in the States?—Yes; after they have ome time in the country, they are as the greatest drunkards we have. holesale price of whisky is, with ie-pence per gallon, and they ap-iot to be able to overcome the tion. Our own workmen are *educated, and more intelligent and ioral, and refrain more from sensual ence.*

does the discontent of the English en, of which you have spoken, y manifest itself?—In the workmen ing masters, in strikes, and demands iges, almost always ill-considered, which the master cannot comply, hich grievously interfere with his ercial operations; their ignorant ations generate ill will and hostility ls the masters.

no jealousies entertained by the can workmen towards their mas-—In America we never hear the word ; they usually speak of the manu-r by name, or as their employer, iew him rather as a tradesman to they dispose of their labour, than person having a hostile interest. are no jealousies between American r and workman of the nature of those appear to prevail between the Eng-orkmen and their employers.

there no combinations to keep up in America?—None, amongst the ican cotton manufacturers.

there no combination laws?—None. what do you attribute this state of among the American workmen?—ieir superior education, to their instruction, and to their temperate

Have you any national system of edu-cation?—We have public schools, sup-ported partly by state funds, and partly by bequests. All children have the pri-vilege of attending.

Do they, in point of fact, very gene-rally attend in the manufacturing states?—They universally attend; and I think that information is more universally diffused through the villages and the whole com-munity of the New England states, than amongst any other community of which I have any knowledge.

What is the general view taken of these schools by the manufacturers and persons of wealth in America?—From their ex-perience they deem them of the greatest importance to the welfare of the state. They are encouraged by the state govern-ments, and all the leading persons of the state.

How do the children whom you employ obtain education?—The manufacturers are always anxious that the children should absent themselves from the manufactory during two or three months of the year to attend the schools. The manufacturer very frequently suggests to the parents the necessity of the children being taken to school. The sending the child to school is generally an inconvenience to the ma-nufacturer.

Is the inconvenience of the children going to the school such as to increase the cost of production?—I do not think it does increase the cost of production. The only inconvenience is in the trouble of getting other hands. We think the ad-vantage of their being educated more than counterbalances that trouble.

What is the nature of this national edu-cation?—It consists of reading, writing, arithmetic, grammar, and geography.

Do the workmen read much?—Yes; we have frequently a difficulty in keeping books out of the hands of some of them when they should be engaged in their work.

What sort of books do they usually read?—Voyages and travels are the most favorite reading with them. They are also great readers of newspapers, and some of the workmen take two or three.

Then what is the cost of each news-paper?—Less than 2*d*.

What wages do you usually give?—We employ them by the year. A person ten years old would get 3*s*. a week; a person twelve years old, 4*s*. a week; fourteen years, 5*s*.; sixteen, 6*s*.; eighteen, 8*s*. Those more advanced in years would earn 10*s*. The smaller children in the carding-room are those who earn 3*s*. a week; those attending the drawing-frames earn from 5*s*. to 6*s*.; those who attend the rov-

ing frames earn 8*s*. a week; girls attending the throstle-frames earn from 5*s*. to 8*s*.; machine makers earn about 5*s*. a day; mule spinners earn about 5*s*. a day; overlookers earn from 5*s*. to 6*s*. a day; assistant overlookers from 3*s*. to 4*s*. a day.

What do the men pay for board when they board with families?—From 6*s*. to 7*s*. per week.

What do young women pay?—Five shillings per week.

And children?—They generally board with their parents.

What is the description of fare usually obtained by the American workmen?—Nearly the same articles as those used by the more wealthy classes. They have as much meat as they wish twice a day; they have fruit pies at every meal; in short, as I have stated before a Committee of the House of Commons, I have paid 8*s*. a week for board, lodging, and washing, and lived as well as I could live in equal lodgings in a village in England for 2*l*. a week.

What is the difference in the effects between fourteen and ten hours work on the health of the persons employed, so far as you have observed in America?—When they worked twelve hours, the thermometer stood at 103°, and they were then more unhealthy than when they were working twelve hours in the winter season; but I believe that those who were in the mill enjoyed better health, both during summer and winter, than those who worked at agricultural employments, or than those who were idle. I state this from my own observation. I resided at the house of a medical practitioner, who had the practice of most of the persons who were employed at the mill, as well as of most of those who were employed in agriculture, and my own observation was corroborated by his reports, as to the sickness prevalent. Thus I received my impression of the superior healthiness of those engaged in the factory.

Are the American children stronger or weaker than the children of the English operatives?—The youngest American children are, I think, rather the strongest. Since November last I have been engaged in visiting the manufactories here, and I should say that, on the whole, the children are rather stronger in America than they are here.

Would you call the English manufacturing children as a body unhealthy?—No. I should almost think they are as healthy as the children in the agricultural districts. I have noticed that the children of a factory in a village usually look better than the children of a factory in a town. I should think this might be accounted for from the difference of the residences in the villages as compared with the residences in the towns, where they appear to work longer hours.

Does your experience in America, of the short as compared with the long hours, enable you to form any judgment as to the probable effects upon the health or comforts of the workmen of a reduction of the working hours to ten in this country?—The climate is so different that I can form no judgment. The longest hours of our work are during periods of the most oppressive heat.

Do the children attend school at any particular period?—No; they attend during one period as much as another.

Do they select the times of the long or of the short hours?—I do not think they make any selection as to the hours of work. If they selected the time of the long hours they would have the night-work of the winter. They would, I think, as soon have the longer hours of the summer to avoid night-work.

What is the nature of your manufacture?—Spinning and weaving coarse yarn.

Is any of it for exportation?—Yes.

To what markets?—South American, West and East Indian markets.

Do you find that you can compete successfully with British manufactures of a similar kind in the same markets?—Yes; although we labour under some disadvantages that you do not.

What disadvantages?—One of our disadvantages is, that in the East India markets we have to pay a duty which you do not pay; and we have to pay six per cent. interest on the advance, which is considerably higher than you have to pay. A further disadvantage we labour under is, that whereas a large proportion of your manufacturers export their goods direct, and are therefore not subject to any commission on the shipment, our manufacturers never export on their own account, and the shipping merchant starts with a commission of five per cent. on the price which the manufacturer receives.

Have the goodness to explain the nature of the charge of five per cent. commission to which the article is subject prior to shipment?—The manufacturer sends his goods to a commission merchant at the shipping ports, who receives five per cent. for selling and guaranteeing.

And notwithstanding these drawbacks you can maintain the competition with us?—Yes; and not only so, but are gaining ground upon you, and have already excluded you from some markets.

From what markets?—Some of the Mexican and South American. Several of our largest establishments have large con-

tracts pending for a long time forward for those markets, at prices which would not give a fair return to the British manufacturer, but are very profitable to our manufacturers.

You say this from having ascertained, during your visit to Manchester and other manufacturing districts in this country, the exact state of the relative prices?—Yes.

What are the present relative prices of yarn,—for instance, of No. 16?—No. 16 water twist, made entirely of good cotton; sells in the United States at 10½d per lb., in England, No. 16 yarn, made from a mixture of waste twists, and a small quantity of bowеds, sells at 11*d*. per lb. The price of 10½*d*. in America is from the commission merchant, who receives 5 per cent. for selling it on eight months' credit; and the price of 11*d*. in England is on three months' credit from a manufacturer.

Do you consider the price of 10½*d*. to be remunerative to the American manufacturer?—Decidedly so.

And do you consider that you have equal advantages in weaving?—Yes.

Have you the means of shewing what is the comparative cost of weaving in the United States and in this country?—Yes, I can show it by the following statement:—

	United States.		England.
Interest on dressing machine	£2 11		£1 12
Ditto twelve power looms	8 6	6 per cent.	4 10
Cost per annum of one horse power	3 10		12 10 at 5 per cent.
Cost of dressing 3,756 pieces	23 9		46 18
Cost of weaving	125 4		156 10
American 10½*d*. per piece	£163 0	Eng. 11*d*.	£222 0

How do you account for the difference between 3*l*. 10*s*. which you state as the cost per annum of one horse power, and 12*l*. 10*s*. as the cost in England?—In America it is water power, which exists there in great abundance, at a very low rent, even in the best situations; whereas in this country it is mostly steam power, or if water power at a very high rent.

What do you reckon would be the effect on the cost of production of your manufacture if the working hours of your mills were, by an act of your legislature, to be reduced from an average of twelve to ten hours?—They would be increased in price about ten per cent.

Have you the means of showing how the reduced hours of work would operate on the cost of production?—Yes, by the following statement:—

Estimated value of the Cotton Manufacture of the United States.

Wages	£2,087,400
Cotton	1,800,000
Profit and interest	1,529,266
Annual value	£5,416,666

Now supposing a legislative enactment to limit the working hours to ten, and in consequence of foreign competition the value of the goods must not be increased, and in order to make the same quantity he must employ one sixth more hands, and the interest on this increased investment must be deducted from the wages, for no other item can be reduced; taking the interest, wear and tear, at 8 *per cent*. upon this further investment, the amount will be 112,819*l*.

£2,087,400	wages, as before
112,819	
£1,974,581	wages after.

The number employed previous to this supposed alteration was 62,157, receiving upon an average annually 33*l*. 10*s*. The number increased to 72,572 would receive 27*l*. 4*s*. Supposing the workmen not reduced in their wages the amount would stand:—

Wages	£2,429,998
Interest on the investment	112,819
Cotton	1,800,000
Interest and profit	1,529,266
	£5,872,073

What, in your opinion, would be the effect of a compulsory limitation of the working hours in this country to ten instead of twelve, upon the manufactures of the United States?—It would tend much to their increase. I think we should not only be able to undersell you in markets abroad, but even in your home market.

Do you mean after paying the present import duty into this country of 10 per cent.?—Yes.

Do you not think that we should be under the necessity, in such a case, of adopting your tariff system?—Most undoubtedly, if you wished to preserve even your home market.

*Evidence of John Adams, Cotton Spinner, at Messrs. Hussey and Sons, Bridgetown of Glasgow.**

Deposes, that he was lately in the United States of America for fifteen months preceding the 8th of October last; that he was at New York; that he worked for three weeks as a spinner at Paterson, eighteen miles from New York, and from 14th November, 1831, till 29th September, 1832, at a cotton factory at Great Barrington, Yorkshire county, state of Massachussets; that he got ready employment at Paterson, but made so little that he proceeded to Massachussets; that he did not find steady employment in that state immediately, and had days' wages of a dollar and a quarter per day paid him while he remained; that he might have had, instead of fixed wages, 12½ cents for a hundred hanks of spun yarn; that the young women and little girls received from 75 cents a week to one dollar and 75 cents; that the power-loom weavers were paid by the piece, and received about from 2 dollars to 2½ dollars; that work people were sometimes difficult to be got, at seasons of the year when the females were jaunting about; that the people are not at all to be depended upon as here for keeping to their work; that he considers the machinery in all the works he saw, and he visited above a dozen cotton factories, to be quite inferior to ours—a hundred years behind us; that he saw no part of their work to be compared with us, and the carding and spinning to be alike defective; that he considers the women to be very smart, and uncommonly moral, and far better educated than here—quite superior to what they are here as to writing; that he came back because he preferred fine work, and his wages or earnings were about as good, taking into account the hours of work till sunset in the United States in summer, and from six and half-past six to half-past eight in winter; that he did not like the truck system, which is general in the United States; that he is persuaded, from all he saw, that the Americans will never in his time compete with our cotton goods in the market; that he is married, and has four children, but that he did not take his family out till he saw how he liked the country; that it does not appear to him on the whole that there is any great difference in the rates of payment at Great Barrington and in this country, except as to the young workers, who receive more, but work longer hours; that they do not, however, remain so steady at their work, being more their own masters there than here; that the American workers seemed very hostile to British workers getting into the factories.

* The cotton mill of the Messrs. Hussey is remarkable, as that at which the finest cotton, up *to No. 180, is spun in Scotland,* and as having the *greatest number of spindles* in Glasgow, about *43,000.*

Evidence of Patrick Boyes, Spinner at the same Mill as preceding witness.

Was lately for about fifteen months in the United States, and returned with Adams in October, 1832; that he was about a year at New York, and worked as a hand-weaver, and could have made three quarters of a dollar per day in weaving cotton of 600 thread, and that he received the same wages exactly for labouring, wheeling, &c., which he did at one time for a few weeks; that he received a dollar and a quarter a day for working for a few days at a factory in Pennsylvania, but he was merely working for a man who was unwell, and he could not get continued occupation; that he was at Paterson; and he thinks very little of their machinery wherever he was; and as for wages, he thinks himself as well off here as he would be there.

Observation of Mr. Commissioner Stuart on the Evidence of the two preceding Witnesses.

The rates of spinning are represented (by Adams and Boyes) as being much the same, so far as respected their own earnings, here and there; but it is to be observed, that both of these spinners must be capital workers, and of course get the highest payments. They are now employed in the finest work in Messrs. Hussey's cotton mill, and in the United States they could only be employed on the coarse numbers of cotton, as they do not in that country spin the finest.

Evidence of Patrick M'Gowan, Cotton Spinner, Glasgow.

Deposes that he considers the competition which meets us in a foreign market is altogether a competition created by ourselves, from the quantity of goods which the British manufacturer sends abroad; that he is convinced that the British manufacturer has nothing to fear from the competition with foreign nations, because on the continent of Europe, although a worker receives lower wages than here, for the time he is employed, yet he actually receives more for the same quantity of yarn produced; that, for example, a spinner produces nine or ten hanks per spindle per week in France, while from the British spinner a quantity from eighteen to twenty-two hanks per week, of the same numbers of cotton, must be had; that with respect to America, he is satisfied that any thing like competition is out of the question; that he has very lately seen specimens of cot-

ton goods brought to this country by workmen belonging to Glasgow, recently arrived from the United States, where they purchased them, and he is satisfied, not only from inspection of these goods, but from what he has heard from these workmen of the inferiority of the machinery in that country, and the high rate of wages and other causes, that the British manufacturer may pay the 37 per cent. *ad valorem* duty on goods exported to that country, and successfully compete with the American manufacturer; that, as to the rate of prices, he now produces a letter, dated Norris-Town, 1st April, 1833, written by Paul Macfeal, an intimate acquaintance of his there, and formerly a spinner in the Barrowfield Mill, belonging to Messrs. James Oswald & Co., addressed to John Henderson, a cotton spinner, in the Calton of Glasgow, from which what follow are extracts:—"I am spinning one wheel, 312 spindles, number twenties. I can make above 30*s.* per week, British money."—"Dear John, you wish for statements of the prices we are paid, and how the market rates; I will do that as far as my information leads me. We can turn off 6,000 to 6,500 hanks per week, that is when we get full work, and we get 20 cents per 100 hanks, that is 10*d.* British money. When I compared our list with the list at home, I found that we had more than the double more for the spinning of 1,000 hanks than they have at home." That in respect to the first extract from the above letter, he is enabled, from the information he himself possesses, to state that a spinner could not (in this country) make above 15*s.* or 16*s.* a week, for spinning one wheel, 312 spindles, number twenties.

Evidence of John M'Vey, Cotton Spinner, Glasgow.

Deposes that on the 29th May, 1833, he received a letter, the extract from which he has now shown to Mr. Stuart, of the Factory Commission, and that he knows that the price paid by Messrs. Bartholomew and Co., and at other cotton factories here, is 4*d.* one-fifth of a penny, making a difference in favour of the American spinner of above one-half, and that the price paid to piecers is far greater in America than here.

Extract Letter referred to by preceding witness, from Mr. M'Vey to John M'Vey:—

"My wheel is 312; Paul's wheel is 348; the size of our yarn is 12 and 20 on an average. We throw off from 6,000 to 7,000 hanks per week; the price is 18 cents a hundred hanks. We pay two dollars and three-quarters a week for piecers."

Evidence of Hugh Shanks, Cotton Spinner, Glasgow.

Deposes that he went to the United States in Feb. 1832, with a view to learn whether he could better his condition as a spinner, and that he was, soon after his arrival, engaged to work at Mr. John Govan's work at Pleasant Valley, Duchess county, on the river Hudson, about 100 miles from New York; that he received from Mr. Govan 6*s.* 2½*d.* sterling for 1,000 hanks of common twenties; that the price paid here for the same quantity at Messrs. Bartholomew and Co.'s, where he at present works, is 4*s.* 2*d.*, and that the lowest price he has heard of as paid at any of the factories in New York State were paid by Mr. Govan; that his reason for leaving the United States, which he did last November, was that he was losing his health from attacks of fever and ague; that such a cotton neckcloth as he purchased at Pleasant Valley for 3*s.* sterling, and which he now shows, may be purchased at Glasgow for 10*d.*; and that a pair of short stockings which he has, and which he now shows, purchased by him at Pleasant Valley for 18*d.* sterling, may be had here for 8*d.*

Evidence of Mr. Wm. Osborn, Jun., Leeds, Chairman of the Short Time Committee.

I think they are fencing us out with high duties in almost all countries, and that they could give us an advance. I have a relation in Charlestown, in South Carolina, and when I last saw him here, two years ago, he remarked how much cheaper and better the English (woollen) cloth was than the American. I understood him to mean, that, notwithstanding the duty, the English cloth could compete very well in that market. He is not in trade there.

General Observations by the Central Board of Factory Commissioners on the Evidence of the preceding Witnesses.

Of the probable effects of foreign competition in interfering with, and eventually supplanting the manufacturer of this country, on the supposition of an increased cost of production by the Ten Hours' Bill, some of the witnesses express themselves to entertain no apprehension, &c. &c. &c. The ground, however, on which such statements are made, appear to us to be vague and unauthenticated.* On the other hand, all the most eminent manufacturers who have been examined, consider that a reduction of hours would give a sufficient advantage to foreigners to induce them to extend their manufacturing establishments.

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* The evidence is contradictory in some parts, but how it can be called either "vague or unauthenticated," we cannot comprehend. Do not the witnesses Adams, M'Gowan, &c. give facts as well as Mr. Kempson? And what reason is there to think (humble cotton spinners though they be) that they are not equally entitled to credit?

Some of the latter class of witnesses give the precise data for calculating the relative cost of production, and all of them concur in the general fact of the great and increasing competition which the cotton, woollen, and linen manufactures of this country are experiencing abroad, and the silk manufacturer in the home manufacture.

[We shall give also, in a subsequent number, so much of the evidence as relates to the state of manufactures on the European continent.]

HEATON'S SAFETY GUN-LOCK.

Fig. 1.

Fig. 2.

SIR,—The following ingenious contrivance has been employed by Mr. John Heaton, of Birmingham, to prevent a recurrence of those lamentable accidents which too frequently happen with percussion guns. It is generally understood that, in a well-made gun, with a flint lock, a discharge cannot take place until the flint is brought up to the full cock. In a percussion gun, however, it is otherwise, for if the hammer is resting upon the *capped nipple*, and is by any means raised a short distance, insufficient to bring it to the half-cock, it instantly falls back upon the cap and fires the piece. Many valuable lives have been lost by accidents originating in this way; and it is to guard against such that the lock, of which a sketch is prefixed, was invented.

The principal novelty and merit of this lock is, that no care or attention is necessary on the part of the sportsman or stranger handling the gun, either to engage or disengage the safety-catch; that being done in the very act of raising the hammer, of which it is a necessary consequence. The advantage of this lock, therefore, over all those contrivances for a similar purpose, which require some *additional movement* to be made, some spring pressed, or some bolt withdrawn, before the piece is protected or discharged, must be strikingly evident.

Mr. Heaton has obtained the object in view very effectually, by the introduction, on the under side of the hammer, of a small catch *a b* fig. 1, which is kept in its place by a small spring. The upper part of the catch projects through the hammer-tail at *a*, and must inevitably be pressed inwards in raising the hammer, which forces out the other end *b*, and if the hammer is suffered to fall, this end comes upon a strong stop, *c*, where it rests, and stops the hammer before it comes in contact with the percussion cap. The position of the hammer and cap, when so stopped, is shewn by the dotted lines in the sketch. This protecting movement is equally brought about, whether the hammer be raised by accident or design: if the gun is brought up to the full-cock, the action of the spring removes the catch back out of the way before it can reach the stop; by pulling the trigger, therefore, the gun is always fired. At the half-cock, or any thing short of that, the catch invariably holds fast upon the stop *c*.

Fig 2, which is a view of the under

side of the hammer detached, shews more clearly the position of the catch *a b*, with the small detaining spring *e*, which always tends to pull the catch back under the hammer, out of sight; but the catch being centred at *d*, whenever the ball *a* is pushed in, *b* is thrown out, and seizes the stop.

This lock is as efficient as it is simple, and when brought into general use will render the percussion gun a very safe instrument. Mr. Heaton deserves the best thanks of the community for this ingenious and humane contrivance.

I remain, Sir,

Yours, respectfully,

WILLIAM BADDELEY.

London, Aug. 15th, 1833.

MR. R. M. MARTIN, AND HIS "TAXATION OF THE BRITISH EMPIRE."

SIR,—Appreciating, as I certainly do, the approbation which you have been pleased to bestow on my recent labours, as "the best popular work on the *taxation of the British empire* which has yet appeared," I cannot avoid requesting you to reconsider the censure you have passed on me, as one of a class of persons who are fast passing away. Whether an advocacy of parliamentary reform for several years; an opposition to the present intended monopoly of the Bank of England; an endeavour to procure for the people short parliaments, vote by ballot, and an extension of the household suffrage; (vide *Morning Advertiser*, August 1, 1833;) and last (not least), whether my recent efforts to procure poor laws for Ireland, as a measure of justice to England, and of humanity to the Irish; (vide Pamphlet in April, 1833;)—whether these principles, independent of others which, in my opinion are equally sound, be indicative of a class with which you would associate me, I know not; but this I can assure you, few individuals have sacrificed more for freedom and the happiness of society than the individual who has now the honor to address you. If I appear desirous of upholding the limited monarchy we at present live under, it is because I do not think the bulk of the nation is yet fitted for a more simple form of government. The time will come (and is indeed rapidly approaching), if no violence be used to hasten it, when, by a general diffusion of intelligence, a democratic government will rule England. It is wise, however, not to weaken or destroy the old fabric until the materials for the new superstructure be at hand, ...

You have been pleased to attack me on the views I have taken of the corn laws, and have quoted Earl Fitzwilliam against me. I have examined the parliamentary documents on the subject, more extensively, perhaps, than his lordship has done, and I find that his lordship's alleged averages are *wrong*.

You have not replied to the facts in my work, but contented yourself with assertions: if you will prove me to be in error I shall esteem it as a favour, as my sole object is truth and justice. If the farmers of England were freed from the infamous taxation now levied on them, then, I say, let them start on a fair footing with the grain grower on the Vistula, and I am sure their superior industry and skill would enable them to compete successfully with any farmers in the world.

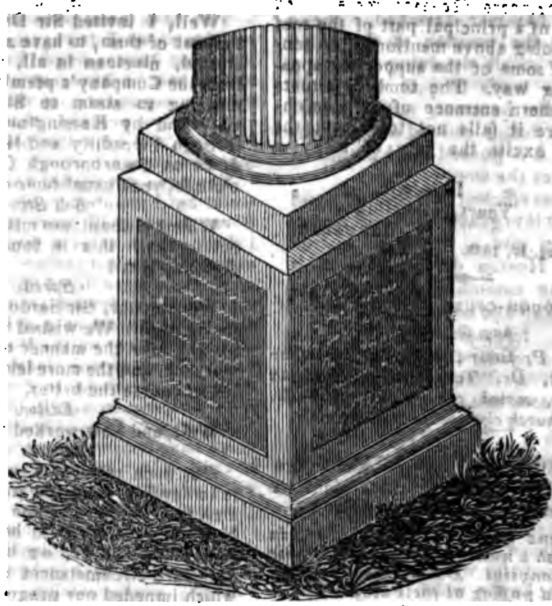
Allow me, in conclusion, to observe that I have not scraped materials from Mr. M'Culloch, Sir Henry Parnell, &c.; my work was prepared from documents in the House of Commons' library, where probably those gentlemen obtained some of their statements; but they have not given to the public the one-twentieth part of what my work contains. In haste, I remain, Sir,

Your obliged and obedient servant,

R. MY. MARTIN.

Effingham Wilson's, August 1, 1833.

[When we spoke of Mr. Martin as belonging to an "order of politicians probably nigh extinct among us," we did so (as may be seen by reference to our remarks, p. 268,) with special allusion to his ultra-royalist opinions—Mr. Martin having, in the work of his, which we reviewed, contended in express terms that the crown of this country is as much a matter of personal property, transmissible from father to son, as any private gentleman's estate. We were not aware that Mr. Martin advocated at the same time so many sensible measures as are enumerated in his present letter; and cannot, on the fullest reconsideration, take much blame to ourselves for never suspecting that there could be much that was sensible, on political subjects, concealed under such boundless devotion to kingcraft. That we were right in saying he belongs to an order of politicians—*quoad* his hereditary-royalty principles—that is "fast passing away," is confirmed in a very remarkable way by Mr. Martin himself; for it seems that, even in the short period which has elapsed since the publication of his book, he has come round to the opinion that "the time will come—and is indeed rapidly approaching—if no violence be used to hasten it, when, by a general diffusion of intelligence, a democratic government will rule England"! No violence, be it observed—no forcible defeasance of course of the right of succession; the change is to be effected simply by a more "general diffusion of intelligence"! With respect to the Corn Laws, Mr. Martin says we have contented ourselves "with assertions." We wonder at this, for on re-perusing the only paragraph we devoted to the subject (p. 270), we find that it consists altogether of facts, and of very stubborn facts too. If Mr. Martin will but condescend to try the nuts we have presented to him, we [illegible] to think he will find them both much harder and sounder than he imagines.—ED. M. M.



ARTIFICERS' TOMB IN ST. PHILIP'S CHURCHYARD, BIRMINGHAM.

Sir.—Strolling in the very extensive churchyard of St. Philip, Birmingham, a short time since, I was struck with the singular appearance of one of the tombs, nor was my interest at all lessened on reading the inscriptions which it bore. Being much pleased with the good taste and good feeling which erected so appropriate a memento of the unfortunate calamity it records, and believing a more than ordinary degree of interest attached thereto, I took out my pencil, and brought away both tomb and inscriptions for insertion in your Magazine.

The accompanying sketch of the tomb is my first attempt at isometrical perspective, for a knowledge of which I am proud to confess myself indebted to your valuable contributor, Mr. Jopling.

The four sides of the tomb bear the following explanatory inscriptions. The verses are from the pen of Miss L. A. Twamley, a young lady of considerable talent, and great poetical celebrity in Birmingham.

Sacred to the Memory of
JOHN HEAP,
Mason and Architectural Carver,
Who was killed by accident on the 26th January,
1833,
In the xxxvith year of his age,
While assisting in raising the roof
Of the Birmingham Town Hall,
To which service he was a Volunteer.
Joseph Hansom and Edward Welch, Architects,
With the Builders and his Fellow-workmen,
Erected this Monument,
In commemoration of
A skilful, honest, and industrious Workman,
A good Husband, and a good Father.

Here also are interred
The mortal remains of
WILLIAM BADGER, Stone Mason,
Who died from injuries received by
The same accident through which
John Heap met his death.
He died respected and much lamented
By his Friends and Fellow-workmen,
February XVII. MDCCCXXXIII.
Aged XXVI years.

"In the midst of Life we are in Death."

The section of a Column surmounting this Pedestal
is a part of
The last workmanship of the Deceased.
THE PEDESTAL
Itself was voluntarily wrought by his Fellow-workmen;
The marble being the gift of his Employers,
And the same as that of which the Town Hall is constructed.

"He will rise again."

Why should the monumental tribute rise
Alone where Grandeur's mould'ring remnant lies?
Or why the sculptured mockery of woe
Claim Pity's tear for worthless dust below,
Whose unregarded grave had been forgot,
But for the costly tomb that marks the spot?
Far other feelings raised this humble shrine;
Far holier thoughts inspired the simple line,
That fain would tell, with sad and grateful pride,
The mind, worth, enterprise of him who died,
Who chose a lowly, but a just, career,
Led by the love of science to his bier,
And wrought, as though prophetic of his doom,
The touching emblem that surmounts his tomb.

The unfortunate deceased were killed by the fall of a principal part of the roof of the building above mentioned, in consequence of some of the supporting apparatus giving way. The tomb is situate at the southern entrance of the churchyard, where it fails not to attract the notice and excite the pity of many a passer by.

I am, Sir,
Yours, respectfully,
W. BADDELEY.

London, Aug. 17, 1833.

PETERBOROUGH-COURT CONVERSAZIONE.

Aug. 31, 1833.

The Editor, Professor Crackwell, Counsellor Tout-Voix, Dr. Tangent, and Solomon Secundus, seated around the table—St. Bride's church clock heard striking.

Editor.

How's this? Nine o'clock, and so few arrived! How strange! Last night we were crowded to suffocation, and now—

Noise and bustle in the court, and in rush a number of persons, with Sir Dionysius Dawplucker blowing and puffing at their head.

Editor.

How now, Sir Di? And good friends all? You seem agitated.

Sir Di.

Agitated, Sir? Say, rather, shaken to pieces.

Sol. Sec.

With laughter, Sir Di?

Sir Di.

No, faith. 'Twas no laughing matter, believe me. Speed will tell you all about it.

Speed.

Why you must know, gentlemen, I was politely offered by my friend Toplis, who is Director in chief of the Paddington Steam Omnibus Company, the use for this afternoon of a new carriage, which they have constructed, called the ECLIPSE.

Crackwell.

Is that another of Hancock's?

Speed.

No, Hancock and the Company have quarreled, and this is a new carriage constructed by an engineer of their own.

Sol. Sec.

The same person, I believe, who advertises to supply other people with steam-carriages, that will answer to admiration, before he has been able to construct a good one for himself.

Editor.

I believe the same: but allow Mr. Speed, if you please, to proceed.

Speed.

Well, I invited Sir Di, Barbette, and the rest of them, to have a ride in it. We started, nineteen in all, at four o'clock, from the Company's premises, City Road, meaning to steam to Shepherd's Bush, go round by Kensington, and, returning through Piccadilly and the Strand, to set down at Peterborough Court by eight o'clock, your usual hour of assembling.

Sol. Sec.

Which is about ten miles in all, I calculate, and this in four hours! Prodigious effort!

Speed.

We did not, Sir Sardonicus, go for velocity at all. We wished to get a thorough insight into the manner of the machine's working, and the more leisurely we travelled of course the better.

Editor.

Well, and how worked it?

Speed.

Oh, upon the whole, admirably. That is to say, so far as the principle and construction of the machine were concerned. Nothing, indeed, could have been better—but, unfortunately, we had a number of untoward circumstances to contend with, which impeded our progress a good deal, and caused one or two rather unpleasant accidents.

Stranger.

Yes, very untoward circumstances indeed.

Editor.

Your name, if you please, Sir?

Stranger.

Dick Rattler, at your service; first cousin to Mr. Speed. The circumstances, as I was saying, *were* very untoward indeed. First, as we were going down Pentonville Hill, a little screw got loose, and that, you know, is a thing which might happen to the best of machines.

Sol. Sec.

To be sure! And to the best of people! Your loose screw is a notorious mischief maker.

Rattler.

And so it took us a full half hour to get that screw tight again. But when we did start anew, cranks and crinkums! how we did go it! I think we must have made the distance, between King's Cross and the Yorkshire Stingo, in less than twenty minutes. But by this time, as bad luck would have it, the cylinders had began to prime.

Tout-Voix.

What's that?

Rattler.

Why it's a phrase engineers have to signify the state of cylinders when the water gets into them from the boiler, or

what I should call in a *prime* bad condition; but that, the engineer assured me, was all owing to our having been supplied with confoundedly dirty water, and that you know is a thing which might happen to any body.

Sol. Sec.

Happens every day.

Rattler.

Well, so much water was in consequence spurted out on the road, that, as we left the Yorkshire Stingo, the cads and other yokels laughed, and shouted after us, "See at the new water cart!" Our steersman, who takes great pride in his engine, got angry at this, and turning round his head to say something smart to the rascals, at that instant another steam carriage came, at full speed, right across our path from a side street.

Crackwell.

Good heavens! And struck right against yours?

Rattler.

No, this once we were in luck; for, in the very nick of time, when a concussion seemed inevitable, that would have sent us all to kingdom come, a large over-driven ox rushed in between the two vehicles, and received the shock that seemed destined for us.

Crackwell.

How providential! And the poor ox?

Rattler.

Was smashed dead—all of a heap—as if struck by lightning.

Editor.

And whose carriage was this that you encountered?

Rattler.

Squire and Macerone's, which, I understand, is constantly practising in and about Paddington, and is famous for accidents of this sort.

Crackwell.

Yes; it knocked a house down once.

Editor.

No, it only carried away one wing of it, and that through the inexpertness of the steersman; which, of course, as Mr. Rattler would say, argues nothing against the machine itself.

Speed.

Certainly not, no more than the untoward occurrences which Rattler has so accurately related are to be considered as disparaging to the machine on which we were mounted.

Second Stranger.

'Tis, to my mind, a clear case. From the water being foul——

Editor.

Another friend of your's, Mr. Speed, I presume?

Speed.

Beg pardon for my neglect, Mr. Editor; my friend Mr. Dick Dubious. Dick, my friend the Editor.

Editor.

What?

"Dick Dubious the metaphysician,
Who loved philosophy and a good dinner."
(Don Juan.)

Dubious.

The same; and one who, though personally unknown to you, Sir, has been a constant admirer and frequent correspondent of your inestimable journal.

Sol. Sec.

Which may account, perhaps, for the many *dubious* things that have appeared in it.

Dubious.

I was about to observe, gentlemen, that it was a clear case; inasmuch as it was the water being foul that caused the cylinders to prime, and it was the priming of the cylinders that caused the cascading on the road, and it was the cascading on the road that caused the bystanders to shout, and it was the shouting of the bystanders that caused our steersman to turn his head, and it was that turn of the head which placed us all in jeopardy.

Sol. Sec. (Chaunting.)

This is the house that Jack built; this is the malt that lay in the house——

Editor.

Peace, Solomon! Let us hear the rest of the adventure.

Rattler.

Leaving Squire and Macerone to settle with the drover as they best could for the demolition of the ox, we hurried onwards, and reached Bayswater without any further accident or interruption. Here we stopped to take in water and fuel, and to clear the fire bars from clinkers, which had accumulated so much as almost to put a stop to the draught. Toplis said it was the badness of the coke that caused the clinkers, and, since such was the case, the engine of course could not be to blame; nobody, you know, can help being served with a bad article at times.

Sol. Sec. (Aside.)

No, not even with a wretchedly bad engine.

Rattler.

Well, after being detained for this purpose about half-an-hour, off we started again, and were going in beautiful style down Notting Hill, when the engineer happening to reverse too suddenly the action of the steam, to allow a large carrier's waggon to pass, one of the cylinders gave way, with a tearing noise, like to the rushing of a prodigious rocket. Stopped to examine into the cause, and

overed that the fracture was owing
flaw in the iron employed. Only
k how provoking! Who could pro-
against such a disaster as that?

Sol. Sec.

Who, indeed? considering how *noto-ly bad* all our English castings are!

Rattler.

ortunately there was a smithy close and, and the damaged cylinder was made secure by a strong hoop of iron. Started once more, and went very smoothly and steadily through herd's Bush and Hammersmith, as s Holland House, when cousin Har- who was with us——

Editor.

usin Harriet? Who do you mean? Harriet Norwich, the famous tale er?

Rattler.

rs, the very lady. Harriet, you must v, is writing a tale of locomotion, to alled, "The Pack Horse and Fire d," and hearing of my being invited on this steam excursion, she in- d on accompanying me, in order that might collect some real matters of for her story. Well, as I was saying, we reached Holland House the ght struck cousin Harriet, that, as her l, Lord Brougham——

ius Redivivus. (Emerging as usual from a cloud.)

iend? Alas! Alas!

Rattler.

Was then dining with the noble er of the mansion, it would be paying a pleasant compliment were we to up to the house, and shew off ngine. Having mentioned her wish eed, he at once consented, and off urned from the road. Luckily the gine never performed better than just s time. Oh, how gallantly it went e avenue, snorting like a war horse, topped all of a sudden in front of the ning room, as if under the curb of imperial rider! In an instant the r table was deserted, and every win- was filled with the wondering guests. Holland himself, though all on hes, was there, smiling blandly on modern wonder; while Brougham, at de, gave one of those extatic twitches he nostrils which seemed to say, at do you think of my thunder?" nd was observed to whisper to the cellor, who was observed to whisper me one else, who in a minute or two was seen to advance from the house, h measured steps and slow," towards rriage; "Is not Miss Harriet Norwich ?" he asked; on which cousin rose and ered in her usual abrupt way, "Yes, Sir, Harriet Norwich—*the* Norwich—is here; what are your commands?" "I am commanded, fair lady, by my Lord Chancellor, to say that he has been requested by my Lord Holland to beg that you will do him the honour to alight and partake of the hospitalities of his humble mansion." Scarce had the words escaped from the minion's mouth, ere Harriet had descended from the carriage, and accepted Mr. Chamberlain's proffered hand, simpering the while, "*Honour!*" "*Humble* mansion!" "Oh dear!" Feeling somewhat queer at being thus left a spectacle for the great folks in the great house to gaze at, I called out to Harriet, "I say, Coz, what's to become of us, while you're doing the grand there? Can't we go with you?" "Go with *me!*" she replied, with prodigious disdain, "no, Sir, I go alone; you and your friends *must* steam about there in front of the house for a while; I shall return to you presently." On this, a gentleman in the after part of the carriage, who had, ever since our turning off the road, been grumbling excessively, and who I understand is a retired major, of the name of Barbette—

Barbette.

Yes, Sir, a retired major; but ever, as you will find, a most forward old gentleman when there is any point of honour or of good feeling to stand up for. I did grumble, it is true, and well I might, methinks, at being shewn up in this way, like some great Bengal tiger, for the entertainment of such an apostate coterie as that of Holland House.

Rattler.

I don't blame Major Barbette for feeling annoyed at the circumstance—I was a good deal hurt myself at cousin's cutting us in the way she did. But, as I was saying, when the Major heard Miss Harriet say that we *must* steam about in front of the house, while she paid her respects to the party within, he broke out into a fit of most ungovernable rage, and swore that he'd be d——d if we should. Speed tried to pacify him, but in vain. The Major protested that he would make a personal affair of it with Speed, if he did not steam off instantly, and being warmly seconded by Mr. Testall, Mr. Crucible, and some others of the party, Speed was forced to yield. So off we set at full speed down the avenue, while Cousin and her noble friends, imagining, I fancy, that we were only taking a little turn for their amusement, waved their handkerchiefs and clapped their hands, as if in high glee at the sight.

Editor.

And were you really so rude as not to return for your fair cousin?

Rattler.

'Twas her own fault; she gave us the cut arrogant, and we did but give her the cut valedictory in return.

Crucible.

Had we returned, Mr. Editor, probably we should not have been here to-night, and that will with you, I am sure, be reason sufficient for the course we took. We left the fair lady in company she preferred, and which she is known to be proud of.

Rattler.

Soon after regaining the road, the engineer complained of a great deficiency of steam. Stopped to examine, and found that the infernal clinkers had again nearly choked up the fire bars. Stoker set to work to clear them, but using his poker too roughly, he broke two of the bars right through the middle. What was to be done? No fire grate, and four miles yet to do! Observed that there was a marine store-shop hard by. Speed was sent in to rummage for something that might serve by way of substitute, and returned with a prodigiously large gridiron. Just the thing, however—fitted in to a nicety. Asked the store-dealer how he came by such a monster? Answered that he had bought it of a queer old gentleman who lived in the neighbourhood, and had had it stuck up on the front of his house, by way of sign or ornament, for several years, but had lately parted with it for the sake of some new whim. Asked his name, and was told "William Cobbett!" (Great laughter.) You may laugh: we all laughed too till our sides were like to split. The major, who was quite restored to good humour by the incident, has been chuckling ever since at the thought of it.

Editor.

Well, it served your purpose, you say; so I hope you got on without any more such interruptions. 'Twas high time!

Rattler.

Yes, we did get on at last, and in good style. Never stopped once after leaving Kensington, 'till we reached your door here; threading our way through the crowded thoroughfares of Piccadilly and the Strand with an exactness and facility which called forth universal admiration. The only thing we had to find fault with in this latter part of our excursion was, the noise and shaking which, on our getting upon the stones, became almost too much to bear. Must say that such jolting, and rumbling, and grating, and creaking, I never met with in any carriage in all my life before. The more surprising, too, that the carriage was mounted on springs of an improved construction, invented by the company's engineer. Was assured, however, that it was all owing to that unfortunate priming of the cylinders in the first instance; for the water, getting where it should not have gone, washed away all the tallow, and that you know, gentlemen, is a thing which might happen to the best of engines.

Speed.

I believe I may say that, upon the whole, every one of the party felt convinced, by our excursion, that the engine is a very admirable engine, and that the main difficulty of travelling by steam on common roads is now completely overcome, leaving only such a mastery of the minor details to be acquired, as practice alone can impart, to render steam carriages by far the safest, cheapest, and most expeditious vehicles that can be used on common roads.

Sir Di.

I, for one, must distinctly dissent from that opinion. I have remained silent during Mr. Rattler's amusing account of our excursion, in order that I might see how far ingenuity could serve to give an air of triumph to what I must consider as, upon the whole, one of the most discouraging experiments ever made. Neither, perhaps, should I care to make any remark on the plausible explanations he has offered of the various accidents and obstructions we encountered, but that they are so characteristic of the whole class of steam carriage experimenters, with scarce a single exception. It is always with them some minor or accidental circumstance that is to blame for every failure —now the water, now the fuel, now the iron, and anon some little screw; but never the general principle of the machine itself. Every carriage which has yet made its appearance has been for a time the very thing; but, though full seven years have elapsed since we have been tantalised with such announcements, we seem to be nearly as far as ever from witnessing the general application of steam power to travelling on common roads What ought we in reason to infer from all this, but that there is some real difficulty in the background which has yet to be overcome? I am not qualified to offer any critical opinion as to the capabilities of the particular carriage now in question; for I am no engineer, and but little versant in such matters. It may *possibly* be all that Mr. Rattler and Mr. Speed have represented—the "very thing" in reality at last; but I have my doubts, and I will briefly mention on what grounds these doubts rest. First, there was no proof that the water was foul, and but little probability that so serious a blunder should have been committed. Neither was there any proof that the coke was impure, nor that the iron was defective.

Now, if the water, and the coke, and the iron, were all unexceptionable, what must follow, but that it was the natural action of the machine itself—the great friction to which it was subjected, and the inefficiency of the means employed to obviate or modify the effects of that friction—which caused the priming and the clinkering, and all the stoppages and accidents of which they were the occasion?

Dubious.

I, too, must beg to be classed among the dissentients, and for this further reason, in addition to those which have been so well stated by Sir Dyonisius, that the clinkers which Mr. Rattler affects to treat so lightly, would have been produced whether the coke were pure or impure, and that they constitute, in fact—if I am rightly informed—one of the greatest practical difficulties which steam carriage speculators have to contend against.

Editor.

It is certain they do; but I was lately told by Mr. Hancock, that he had devised a method by which this difficulty is completely obviated.

Dubious.

Let us hope this may prove true.

Sot. Sec.

Meanwhile the sum of all that has been said, seems to be that this new carriage "Eclipse," which was to *eclipse* every thing that had gone before it, has done no more than has been done twenty times before, and in many instances a great deal better.

Editor.

The mere practicability of travelling by steam on common roads is a thing which no longer requires demonstration. All that is now wanted is satisfactory evidence that it can be followed up for a continuance with advantage.

Crucible.

And for that purpose we must have a fuller and fairer account than has ever yet been furnished, in any one instance, of the expense of working such a carriage, under the various heads of engineer and assistants, water, fuel, repairs, interest of capital, &c.

Sir Di.

"So much for Buckingham!" Let us now talk, if you please, of something else. What have you got there, Mr. Editor? *(pointing to a huge volume, with a blue paper cover, lying on the table.)*

Editor.

Oh, the Report of the Factory Commissioners; a prodigious mass, is it not?

Sir Di.

Yes, faith; but of what quality?

Editor.

Of very various quality; but, upon the whole, of a substance most honorable to the diligence, intelligence, and sagacity of the gentlemen of the commission. They seem to have shrewdly given as wide a scope as possible to their inquiries; and have, by this means, collected a body of information on the state of the manufactures and manufacturing population of this and other countries, which, in point of authenticity, originality, and importance, is probably without its equal.

Sir Di.

I scarcely expected, Mr. Editor, to hear such an account of this *omnium gatherum* from you. I have been told, by some clever friends who have gone through it, that it abounds in the most partial and prejudiced views of things, and betrays altogether a most reprehensible leaning towards what I may call the *foreign* side of the question of national education and industry.

Editor.

I admit that it does contain many partial and prejudiced views of things, even on the part of the commissioners themselves; but who can wonder at this, who is aware of the conflicting interests of the various witnesses who were examined; or that, in many instances, the commissioners were required, by the sapient head of our Home Department, to furnish, by *return of post*, a complete digest of the result of several weeks of arduous and unceasing investigation.

Sir Di.

But the foreign leaning; you do not mean, I presume, to justify that?

Editor.

I think the leaning is more frequently on the side of the evidence than of the Commissioners; and if the evidence be correct, of course the Commissioners cannot be to blame that they leaned to the side of the truth.

Sir Di.

But the Commissioners may have been to blame that they did not procure the best evidence in every instance of which the case admitted. To be plain with you, I have been told that while, on the one hand, the manufacturing classes of England are described as being in general grossly ignorant, debauched, and wretched, those of the United States are praised to the skies as the most educated, moral, and happy set of people in the universe; though, if the *whole* truth were known, neither representation is within a thousand degrees of the truth.

Editor.

Yes; there is, in particular, the evidence

of Mr. James Kempson,* the great cotton spinner of Philadelphia, who swears that in the Union they have public schools, which "all children have the privilege of attending," and that "in the manufacturing states" they *do* UNIVERSALLY *attend.*" He adds, too—mark this Sir Di., "And I think that information is more generally diffused through the villages and the whole community of New England states, than amongst any other community of which I have any knowledge."

Sir Di.

Yes, Sir, I do mark it; and I must, with all due respect for Mr. Kempson and brother Jonathan, say, that a more impudent falsification of notorious facts (on the other side of the Atlantic at least) was never attempted in the face of the civilised world. I have marked this too, Mr. Editor, that this evidence of Mr. Kempson has been quoted in the Report of the Central Board of Commissioners, without the slightest exception being taken to it—as evidence, in short, that is altogether unanswerable.

Editor.

Well, Sir Di., we have, as yet, but your word to the contrary.

Sir Di.

The proofs, Sir, are at hand, and such as all the Kempsons and Commissioners in the world cannot refute. Here, Sir, in the first place, is a Report of "the Pennsylvania (the very state to which Kempson belongs) Society for the Promotion of Public Schools," dated the 28th April, 1831, little more than two years ago, in which there occur these remarkable words: —"There are at least 400,000 children in Pennsylvania between the ages of 5 and 15. Of these, during the past year, *there were not* 150,000 *in all the schools in the State.* Many counties, townships, and villages, have been taken *indiscriminately from all parts of the State,* and been examined by your memorialists; and *the average proportion* of children educated in any one year, compared with the entire number of children between the above specified ages, appears to be BUT ONE OUT OF THREE (!) It is probable that this proportion prevails generally through Pennsylvania, and justifies the assertion that *more than* 250,000 *children, capable of instruction, were not within a school during the past year.*—Many of these children *never go to school at all.*" Again: "In the city and county of Philadelphia there are ample means for the education of every child, and many thousands have been educated by them. In that district, and we believe the case is the same in the city of Lancaster, no one need be uneducated, except from choice. *But* throughout the rest of the State there is no other provision for the education of the poor than the Act of the 4th April, 1809. This law has almost entirely missed the mark at which it was originally aimed. It is inefficient; because in some places its existence is unknown to those for whom it was intended; in others, the assessors and county commissioners refuse to act up to the spirit of its requisitions; in a few the teachers refuse to accept scholars under its provisions; and in very many there is an unprincipled distinction made by the teachers between the children paid for by the county, and those of richer parents,—the former receiving less of their attention than the latter, though their rights are equal, and their claims to sympathy greater." Only reflect on these facts, gentlemen; facts, the reality of which is beyond all suspicion,—and tell me what you think of the man who, being a resident of the state of Philadelphia, the employer of several hundreds of workmen, and intimately acquainted, of necessity, with the state of education among the working classes of that State, could swear (the minutes state he was "*sworn*") that they do "*universally* attend" the schools provided for them!

Editor.

Mr. Kempson, you will observe, limits his statement to the "manufacturing states." Now I am not sure that the state of Philadelphia can be considered among the number.

Sir Di.

Why not? It yields, I believe, only to New York in point of commerce and manufactures. But I believe you may take almost any of the states, and you will find the condition of things nearly the same. Here is a Report of a Committee of the Friends of Education in New Jersey (another old state), drawn up in 1828, from which it appears that in that state, containing then about 280,000 inhabitants, there were 11,742 children entirely destitute of instruction, and about 15,000 adults who were unable to read. "In many towns," says the Report, "more than half of the children never attend school." Here is another Report from the Commissioners of Public Schools in the rich and flourishing city of Baltimore, dated 3d Jan. 1831, which states that there are within the limits of the city 14,297 children between 5 and 15 years of age, and only 6,250 who attend school,—not one-half the entire number. I have here, also, a recent Report of a Committee, appointed by the House of Representatives of Ken-

* See the Evidence in another part of our present Number, on the State of Manufactures in America.

tucky, in which it is stated that the aggregate number of children in 34 counties, from which returns had been received, (nearly as many counties had made no returns whatever) was 51,702, and that the whole number at school was only 10,945, little more than one-fifth. With such astounding facts as these before us, how is it possible to listen with common temper to statements which represent the Americans as being in general the most educated people in the world? I doubt much whether, even in the remotest parts of this *benighted* country, there is a single district of it of which such a report could be made as that which I have quoted respecting Pennsylvania, the very head quarters of American civilisation. I must not forget, too, to mention what the authors of that Report say in their winding up: "This general statement neither aggravates nor colours the plain truth; *on the contrary, it is a faint sketch of a formidable reality.* This subject could not, indeed, be presented in its entire dimensions otherwise than by embodying *the mass of gloomy* facts collected by your memorialists."

Editor.

The facts you have cited, Sir Di, are certainly not to be easily gainsayed. I have always had great doubts as to the superiority, in point of education, claimed for the Americans; but I had no idea that the truth lay so entirely the other way.

Crackwell.

All this is quite new to me, and I suspect to most people. The Americans have been so constantly held up to the British people, by their own journalists and writers, as patterns in all that regards education, that I am quite in a bewilderment at what Sir Di has told us.

Sir Di.

I hope it will not be thought, from what I have said, that I look with any degree of contentment on the state of education in our own country. Far from it, I know it too well to be most deplorable; but I cannot allow that there is any good to be effected by representing matters as worse than they really are. I detest all trickery and delusion, and place unlimited dependence on the saving virtue of the naked truth. It can do no good to the Americans to be held up for better than they are; but, on the contrary, must do them a great deal of harm, by fostering in them one of the greatest obstacles to national improvement, namely, national conceit; and it can do no good to the English to be taunted by allegations of inferiority which have no foundation: since, sooner or later, the deception must become universally known, and, when known, is almost sure to induce a degree of relaxation in the cause of education, far more than equivalent to any fictitious impetus that can have been derived from it. Let us encourage, by all means, an active rivalry between the two nations in the work of civilisation; but let it be a rivalry enlightened by a clear and accurate knowledge on the part of each of the wants of the other and of their own, and inspired by a generous desire to make the attainments of each a common benefit to both.

Editor.

A noble wish, in which every true friend of his species must heartily join.

Sir Di.

There is another thing which deserves remark. In consequence, it seems, of its appearing, from the inquiries of the Commissioners, that were the working hours of the factory children diminished in number without at the same time providing schools where they might occupy their spare time to the advantage of their minds, it would only be giving them greater leisure to be become vicious and depraved. In consequence of this, ministers have introduced into the bill which has been just passed for the regulation of the factories, certain excellent provisions for the education of the infant labourers. But on whom will the carrying of these provisions into effect depend? On the manufacturer, of course; and exactly in proportion to the sincerity and earnestness of their co-operation, and to the breadth of their views on the subject of education, will be the practical success of the scheme. You may appoint visitors and inspectors without number, and impose all manner of restrictions and penalties, but unless the masters shall, of their own accord, join heart and hand to put the law in force, the benevolent intentions of the legislature will most assuredly be frustrated. We shall witness here the same thing which has been witnessed in America—laws full of benevolent concern for the education of the poor rendered almost wholly inoperative through the indifference and selfishness of the rich.

Editor.

Mr. Kempson says that the rich in America are all in favour of schools, deeming them of the greatest importance to the welfare of the state.

Sir Di.

An assertion which I apprehend is only to be matched by that other assertion of his, of the universality of education among his countrymen. I do not see how it is possible to reconcile such a statement with the "mass of gloomy facts" disclosed in the Reports on the State of Education in America, which I have before quoted. I suspect that there is, in this respect, but

little difference between the American rich and the British rich. Both have no objection to their poorer countrymen getting a *little* education, but such a prodigious fear of their getting *too much*, that they would rather see them go without any than run the least risk. I understand there runs through the evidence of most of the master manufacturers who were examined by the Factory Commissioners—which is the other point to which I wished to direct your attention—such narrow and contracted views of the extent to which the education of the working classes should be carried, as is almost incredible, and as quite forbids the hope of any material progress being made, through their agency, in the improvement of the moral condition of the great mass of our manufacturing population.

Editor.

I do not think that is a correct representation of the general tenor of the evidence, nor, I would fain hope, a true picture of the sentiments of any considerable portion of the British manufacturers. Some two or three of the witnesses have, it is true, expressed themselves in the way Sir Di describes; and, because they are men of considerable repute, it has probably been inferred that they speak the prevailing sentiments of their class; all this, however, must be mere conjecture, and furnishes by far too slender a basis for any general conclusion as to the opinions of the manufacturing body.

Crackwell.

What do the two or three witnesses you speak of say?

Editor.

The evidence which has tended most to produce the unfavourable impression conveyed to our friend Sir Di is, I suspect, that of Mr. John Marshall, the Member for Leeds. This gentlemen has laid it down as quite an evident and indisputable thing, that the children of the labouring poor should "*acquire all the education suitable for their station in life*, BEFORE THEY ARE NINE YEARS OLD"! "It would not do," he says, "to make it peremptory that such children (of nine and ten years old) should always spend half of their time at school; *because, in many instances, they would require no more schooling.*" Again, "I think that neither boys nor girls *ought to have any more learning to require at that time* (between nine and fourteen years of age), and *that their spare time ought not to be spent at school.*"

Sir Di.

Now only conceive to yourselves, gentlemen, the sort of learning that can be acquired by any child, however clever, before it is nine years old; and tell me what you think of pronouncing such learning sufficient for persons in any station of life whatever?

Barbette.

'Tis monstrous.

Tangent.

A perfect mockery of education altogether.

Sir Di.

And tell me, too, what you think of the head and heart of the man who, professing to be in a special manner the friend of knowledge, and champion of popular rights and interests, takes this consistent method of testifying his sincerity?

Barbette.

This, at least,—that it is a disgrace to Leeds to have such a representative, and a misfortune to England that so hollow a patriot should have any share in its public councils.

Dubious.

You say "a disgrace to Leeds," Major, but why so? How do you know that Mr. Marshall does not represent the actual feelings and opinions, on this particular subject, of the majority of the gentlemen of the Cloth-hall? It may be a disgrace to the gentlemen of Leeds to have such feelings and opinions, but it can be none to the gentlemen so disgraced to have so fitting a representative?

Barbette.

I admit, Sir, the force of your observation; and I will frankly own that when I see the representative of so important a manufacturing town as Leeds taking so arrogant and insulting a view of the extent of knowledge which is sufficient for persons of the working class, I think there is much stronger ground than I at first supposed for inferring that Mr. Marshall does but express an opinion common to the class to which he belongs.

Junius.

No doubt of it! Sir Di is in the right. The masters of England see not yet that the sun of knowledge shines not for them alone. Blind they are, as much to their own true interests as to those of their fellow-men.

Dubious.

Well, after all that has been said of the advantages of knowledge, I cannot help thinking that much more good is expected from it than will ever be realised. It is not through want of education alone that the working classes of England are in so wretched a state, but through a combination of causes, all working to the same end. Take the drunkenness, for example, for which they are unfortunately so proverbial. Will education alone cure them of that? I do not think it will. I have been reading this Factory Report and Evidence,

and I see enough to convince me that though schools were ten times more abundant than they are, gin shops would flourish,—all other circumstances continuing the same,—as much as ever. I have been particularly struck with the evidence of Rowland Detrosier on the subject: it is altogether admirable for its soundness, discrimination, and impartiality; also with that of Edwin Rose, the Manchester engineer, who tells of what he saw of the working classes in France and Germany, and contrasts their condition with that of his brethren of England. Detrosier states broadly, thathe knows of "no class of workmen amongst whom habits of drunkenness are more prevalent than the factory population." "Mere children," he says, "are weekly, almost daily, initiated in the pernicious and debasing habits of smoking and drinking." But see how he accounts for it. "It is a common practice," he says, "to pay the wages of the spinners by rooms, giving the amount to some one man, who is appointed by the rest to receive it; as change is wanted to pay each man his due they adjourn to a public house, the landlord of which agrees to provide them weekly with change: to these places the piecers and scavengers must generally go for their wages; and as change cannot be immediately found for all, drinking commences, and is carried on to the loss of every body concerned but the landlord. Here the children, boys and girls, are regularly initiated in drunkenness; and it is no uncommon thing to see a mere boy smoking his pipe and drinking his pint of beer in imitation of his master. * * * This weekly attendance at the public house makes them almost as familiar with it as with their own homes; and being trained to it from youth, it has a most pernicious effect upon the character and circumstances of the labouring population." Turn we now to the evidence of Edwin Rose. Being asked, "What amusements or innocent recreations a working man has (in England) on a Sunday?" he makes for answer, "None at all, that I know of, but taking a walk in the country, which (he sarcastically adds) is not yet forbidden that I know of." "If a young fellow," here he goes on to say, "wants a little recreation on a Sunday, he gets up early and takes a stroll into the country, and comes home in the middle of the day tired, and then he thinks of a public house. But if he knew that, after the middle of the day, he could go out into the country, to cheerful society and lively meetings, I do really believe he would be more apt to go to church of a morning. I was struck with the advantages that the working class seemed to me to have in *France and Switzerland* over us here in spending their Sundays. It does produce what I never see in England. * * * It seemed to me that they went easier and happier to their work again there than they do here. * * * I did not see them (the French) get beastly drunk, as working men are inclined to do here. * * * At Muhlhausen, after going to church of a morning, where they are regular enough, they would go out into the country to dancing, or skittling, or different games and pastimes." He is further questioned about the villainous compounds which the English working classes are compelled, by our judicious government, to gulp down daily, for the benefit of the landholders and of the revenue; and being asked, whether he does not think it would be a benefit to the working classes here if they could get wine as cheap as it might be got imported into this country? he replies, "I do. You may drink three or four bottles in the day (of any of the light wines of France), and it does not intoxicate at all. Here, a man has no light beverage; whenever he wants to quench his thirst he must drink either heavy beer or gin." Now, gentlemen, it does seem to me—much ruminating on all these things, as my Lord Brougham would say—that a reform in our fiscal system, which would restore home-brewed ale to every poor man's table, and make the light wines of France *his* familiar luxuries, a prohibition of the public house pay-table, and a little less austerity in our religious observances, would do far more than a whole life of schooling, to restore a healthy tone to the working population of England.

Sir Di.

It is not, certainly, all their own fault that the working classes of our country are so debased. Their drunkenness is doubtless in a great degree a vice of circumstance; but it is that vice which, of all others, is most likely to be aggravated by ignorance. Were they but a little better informed, not all the bad laws in the world could tempt them to indulge in such brutal excesses as are now habitual to them. See what the Temperance Societies have done!

Barbette.

I am inclined to think it would do more real good as a preventive than all the dissuasives of all the Temperance Societies ever heard of, if the working classes would but reflect on the immense profits made by these gin shops, at the expense of their deluded frequenters. Some one reproached the Bristolians, that the bricks of their city were cemented with blood, in allusion to the wealth derived by them from their former traffic in the bones and sinews of the blacks. In like manner, I can never contemplate one of these temples of

tippling, which are now rising in such magnificence all around us, without thinking how many orphans and widows' tears,—how many pangs of remorse—how many broken hearts—how many maniac screams, have gone to the production of all this magnificence. Were I compelled, in order to save myself from starvation, to derive my livelihood from such a source, I would, as the poet says, "hang my head, and blush to think myself an Englishman."

Printer's Devil (*Gentlemen Usher for the nonce.*)

Sir, a lady waits outside; she says she was to have come by the topping steamer.

Editor.

Nonsense! Mr. Toplis's steamer you mean. Ask her name. (*Devil exit.*)

Devil re-enters.

Miss Harriet Norwich, Sir—with a gentleman in a domino, who must, she says, remain for the present *in nudibus*.

Editor.

In nubibus, I suppose. Shew them in.

(Remainder in our next.)

WOOD ENGRAVING.

Sir,—In addition to the communication of R., in your number of the 17th instant, on the subject of wood engraving, I beg to mention a method which I have employed with success, of transferring an *outline* to wood blocks, when it has been necessary to *trace* from a print or drawing already done on paper.

Take a piece of transparent glass paper (which I believe is only made in France, though commonly sold at the colour shops in London,) the size of the block: lay this on the print or drawing to be traced; then, with a sharp etching needle, mark over the lines, making a delicate scratch; when this is done, with a piece of soft rag fill in the traced lines with *lamp black*. Fix the tracing on the block (reverse of course,) and by passing a burnisher gently over the whole, with a moderate degree of pressure, the outline will be *clearly* and *distinctly* transferred to the wood block. In case of failure, or from any other cause, the same tracing will yield half a dozen transfers, by refilling the lines drawn with the etching needle with *lamp black*.

I am, Sir,

R. ROFFE.

Somers' Town, August 19, 1833.

LIST OF NEW PATENTS GRANTED BETWEEN THE 22D OF JULY AND 22D OF AUGUST, 1833.

John Petrie, of Rochdale, mechanist and engineer, for certain improvements in steam-engines. July 25; six months to enrol.

Joseph Pelletier, and Jean Adrian Despres, of 11, Finsbury Circus, London, for improvements in making or manufacturing sulphate of quinine, being a communication from a foreigner residing abroad. July 25; six months.

John Kitchen, of Newcastle-upon-Tyne, printer, for certain improvements in printing presses. July 25; six months.

William Rodger, of Norfolk-street, Strand, for certain improvement or improvements in anchors. July 26; six months.

David Rees, of Brecon, South Wales, woollen manufacturer, for improvements on drags or apparatus to be applied to carriages. August 7; six months.

Robert Smith, of the Abersychan iron works, parish of Trevithin, county of Monmouth, gentleman, and John Walkinshaw of the same place, engineer, for an improved rail for railways. Aug. 10; six months.

William Wigston, of the gas works, Salford, near Manchester, engineer, for certain improvements in apparatus for consuming smoke, which improvements are applicable to the furnaces of steam boilers, and to furnaces constructed for other purposes. Aug. 12; six months.

Joshua Bates, of Bishopsgate-street, London, merchant, for certain improvements in machinery or apparatus for cleansing and combing wool, or such other fibrous substances, being a communication from a foreigner residing abroad. Aug. 13. (Time to enrol not specified in our official list.)

John Dyer, of Trowbridge, engineer, for a machine for fulling, thickening, felting, and cleansing woollen cloth, or any other fabric requiring the process of fulling, thickening, felting, or cleansing, in the course and process of the manufacture thereof. Aug. 13; six months.

Francis Stiles Blake, of H. M. dock-yard, Portsmouth, shipwright, for an improvement in fids for the upper masts, running bowsprits, and jibbooms of ships and other vessels. Aug. 14; six months.

John Scott Russell, of No. 8, Stafford street, Edinburgh, M. A., for certain improvements in the construction of vessels for sustaining the pressure of fluids, and in the boilers and machinery of steam-engines, and in the manner of their application to locomotive purposes. Aug. 14; six months.

John Read, of Regent-street, Middlesex, merchant, for certain improvements in machinery or apparatus for raising or forcing fluids. Aug. 19; six months.

William King Westley, of Salford, near Manchester, flax spinner, and Samuel Lawson, of Leeds, machine maker, for certain improvements in machinery or apparatus for preparing, drawing, or roving hemp, flax, wool, and other fibrous substances. Aug. 20; six months.

Sir Charles Webb Dance, of Hertsbourne Manor-place, in the county of Hertford, knt., lieutenant-colonel, and Joshua Field, of Lambeth, engineer, for improvements in the boiler and other apparatus for locomotive carriages. Aug. 20; six months.

William Henry Barnard, of 26, New Broad-street, London, Gentleman, for a solvent not hitherto used in the arts. Aug. 20; six months.

INTERIM NOTICES.

Replies, by R. to Mr. Jopling, and by Aquarius to G. W., are unavoidably deferred till next week.

Mr. Williams—an answer in a few days.—Mr. Mallet in our next.

Communications received from Mr. Beverley—Enort—Iver Maciver—Q. R. S.—Item—H. Dawes—A Special Juryman.

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M. SALMON, Printer, Fleet-street.

Mechanics' Magazine,

MUSEUM, REGISTER, JOURNAL, AND GAZETTE.

No. 526.] SATURDAY, SEPTEMBER 7, 1833. Price 3d.

HARE'S IMPROVED PROCESS FOR THE EVOLUTION OF BORON.

IMPROVED PROCESS FOR THE EVOLUTION OF BORON. BY PROFESSOR HARE.

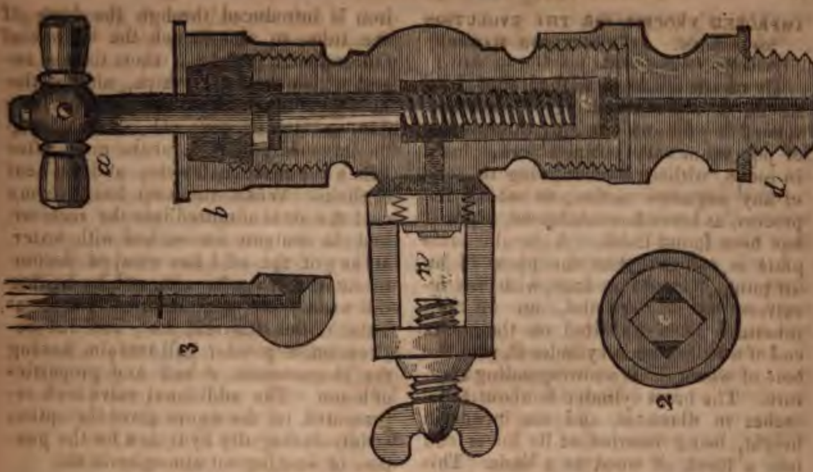
[From the Journal of the Franklin Institute.]

By means of an apparatus, represented in the prefixed engraving, I have succeeded in evolving boron by the reaction of potassium with vitrified boracic acid *in vacuo*, without encountering the evil of any explosive action, to which the process, as heretofore conducted, *in pleno*, has been found liable. A circular brass plate is prepared like the plate of an air pump, so as to produce, with any receivers properly ground, an air-tight juncture. It is supported on the upper end of a hollow brass cylinder B, with the bore of which it has a corresponding aperture. The brass cylinder is about three inches in diameter, and six inches in height, being inserted at its lower end into a block of wood as a basis. This cylinder receives below a screw, which supports a copper tube C, of about two inches in diameter, so as to have its axis concentric with that of the cylinder, and to extend about four inches above the plate. The copper tube, thus supported, is closed at the upper termination by a cup of copper, of a shape nearly hemispherical, and soldered at the upper edge to the edge of the tube; so that the whole of the cavity of the cup is within that of the tube. Hence the bottom of the cup is accessible to any body, not larger than the bore of the tube, without any communication arising between the cavity and the tube, and that of any receiver placed upon the plate, over the cup and tube, as in the figure C. Into the side of the cylinder supporting the plate a valve cock is screwed, by means of which, and a flexible leaden tube, a communication with an air pump is opened or discontinued at pleasure. The cup being first covered with a portion of the vitrified boracic acid, as anhydrous as possible, and finely pulverised, the potassium is introduced, and afterwards covered with a portion of the same acid, two parts of the potassium being used for one of the acid. A large glass receiver is now to be placed on the plate, secured by the rods A A, concentric with the tube and cup, from the heat of which the glass is to be protected by the bright cylinder of sheet brass S, placed around it, so as to be concentrical with the receiver and the tube. The apparatus being so far prepared, an incandescent iron is introduced through the bore of the tube, so as to touch the bottom of the copper cup. In a short time a reaction commences, which, aiding the influence of the hot iron, renders the cup and its contents red hot. A deep flame appears throughout the mass, after which the reaction lessens, and the heat declines. When the cup has become cold the air is admitted into the receiver, and the contents are washed with water. If any of the acid has escaped decomposition, it may be removed by boiling the mass with a solution of potash or soda. After this treatment, and due desiccation, a powder will remain, having the characteristic colour and properties of boron. The additional valve cock represented in the figure gives the option of introducing dry hydrogen for the purpose of washing out atmospheric air.

DESCRIPTION OF THE VALVE COCK, A PERFECTLY AIR-TIGHT SUBSTITUTE FOR THE COMMON COCK. INVENTED BY PROFESSOR HARE.

[From the Journal of the Franklin Institute.]

This figure is intended to illustrate the construction of a substitute for a common cock, which I have been accustomed to call a valve cock. It was devised by me about twenty years ago, among a number of other analogous contrivances, and seems upon the whole less liable to fail than any other which I have tried. The engraving represents a longitudinal section of the valve cock. At *a* is a piston with a collar, enclosed in a stuffing box *b*, so as to be rendered air tight by means of oil leather. Hence this piston may be turned or made to revolve on its axis, while incapable of other motion. Upon the end of the piston a thread for a screw is cut, which fits into a female screw on the brass prism *c*, so as to cause this prism to approach to a retreat from a bearing covered with leather, in the centre of which there is a perforation *o o* communicating with one of the orifices of the instrument. This orifice is surrounded by the male screw *d*, so that by means of this screw the valve cock may be fastened into any appropriate aperture fitted to receive it, subjecting an interposed leather to such a pressure as to create with it an air-tight juncture. The prism *c* has two of its four edges cut off, so as to allow a free passage by it, lead-



ing to the lateral perforation terminating in another orifice, over which there is a gallows screw *g*. By means of this gallows screw, when requisite, a brass knob, soldered to a leaden pipe, may be fastened to the valve cock. The juncture is rendered air tight by the pressure of the screw in the gallows on the leather, which is kept in its place by means of the nipple *n*. The method last mentioned, of producing an air-tight juncture, was contrived by me about seven years ago, and proves to be of very great utility. There is no other mode, of which I am acquainted, of making a perfectly air-tight communication between cavities previously separate, at all comparable to this in facility.

THE UNDULATING RAILWAY—MR. HAM'S PROBLEM.

Sir,—I must request the first corner you can spare, to correct an error of the press, which may render my calculation at page 378 "inexplicable" to some of your readers. "$V = 8 V S$" should have been printed "$v = 8 \sqrt{s}$."

In reference to Mr. Ham's observations in No. 378, I acknowledge my disposal of his problem in No. 518 was no solution of it. But then *I never said it was*—the whole sin and iniquity of the misnomer lies with *you*, Mr. Editor, and I trust you will relieve me of the grievous burden.

I concede to Mr. Ham that it is well known to mathematicians that a body, by falling freely through 16 feet 1 inch, acquires a velocity of 386 inches per second; and I beg to inform him that it is equally well known to said mathematicians that a body does NOT acquire a velocity of 772 inches per second until it has fallen *sixty-four feet four inches;* and that to attain a velocity of 1158 inches per second, it must fall 144 feet 9 inches, instead of 48 feet 3 inches; all which he may satisfy himself of by referring to almost any Introduction to mechanics, and need not "take my word for it."

I shall not discuss Mr. Ham's competency to form a correct opinion on the Undulating Railway or any other subject; but I must confess I should have felt more inclined to respect his judgment if he had taken the pains to ascertain the proper method of making the very simple calculation he has attempted at page 379, before he put himself forward as the champion of a contrivance, the principles of which he evidently does not understand.

Perhaps Mr. Ham will by this time comprehend why his problem has "nothing to do with the question" *which railway is the best?* but if not, I am sorry for him; and I am also sorry I cannot undertake to explain the matter more clearly than it has already been explained.

I am, Sir,
Your's, &c. &c.
S. Y., an Engineer.

16, Lambeth Terrace, August 31.

ISOMETRICAL PERSPECTIVE—"R." IN REPLY TO MR. JOPLING—METHODS OF PROJECTING A CUBE.

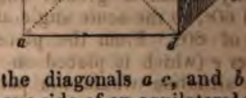
Sir,—I could have wished that Mr. Jopling had answered my last letter more pointedly, as the questions there put by me are not even noticed. I do not know how much more praise of isometrical perspective, on account of its utility, Mr. Jopling can wish for, than I have already bestowed on it.

I will not, at present, stop to insist upon my "favourite angles, as being more agreeable than the angle of 30°, and much more pleasing when applied to general purposes, and consequently less '*unnatural*,'" ("still harping on my daughter"); but hasten to notice those points on which Mr. Jopling "would willingly say nothing more."

Mr. Jopling, in supporting his condemnation of the figure of the press, says, "Suppose, for example, I were to adopt this mode of reasoning:—If, on the principle of radial perspective, each of three sides of a cube be so represented (which they may be), so as to be exactly of the same figure, the angles of the three radii with each other would be 12°, and the boundary line would form a hexagon of equal sides; therefore, 'isometrical perspective' is true perspective, for it differs in nothing from true radial perspective but in this, that in the one case several of the lines are parallel to each other, in the other case not any." And to this Mr. Jopling adds:—"'R.' will not, I think, permit me to reason thus," &c. True, a most reasonable and just anticipation. "R." will not, indeed, permit this reasoning, because it is aside from the point; for, instead of *its* proving the projection of the press to be false, it merely goes to shew that isometrical perspective is projected on principle, a point which had not been disputed. But this is not all: Mr. Jopling says, "isometrical perspective differs in nothing from true radial perspective but in this, that in the one case several of the lines are parallel to each other, in the other case not any." Indeed! No other difference? Suppose that we project a cube on the principle of radial perspective in the manner that Mr. Jopling purposes, and another on isometrical principles, making the hexagonal boundary of each projection to contain an area of the same magnitude, we shall find that, if they are reduced to geometrical measurement, the dimensions will be quite different; that is, the ground plan from which the former is projected must be a great deal larger than the ground plan, or face of the cube, from which the latter is projected. Again, suppose that we project half-a-dozen of cubes by each method, on two continued lines, leaving a certain space between each of them in the geometrical ground plans: on the principle of isometrical projection the 1st and 6th cube will, of course, be of the same size, and the space between the 5th and 6th will be equal to the space between the 1st and 2d; whereas, on the principle of radial perspective, both the cubes and the spaces between them will, of course, diminish as they recede, in the ratio of 6, 5, 4, &c. Yet Mr. Jopling says that they differ in *nothing* but in this—"that in the one case several of the lines are parallel to each other, in the other case not any"! Truly one would think that Mr. Jopling's love for isometrical projection had led him to renounce his knowledge of *perspective* altogether. Now for the figure of the press.

As I, as well as Mr. Jopling, consider "that your readers ought not to have a wrong impression left on their minds," I here subjoin the simplest of two or three methods of representing a cube, on the principles on which the figure of the press is projected (p. 295).

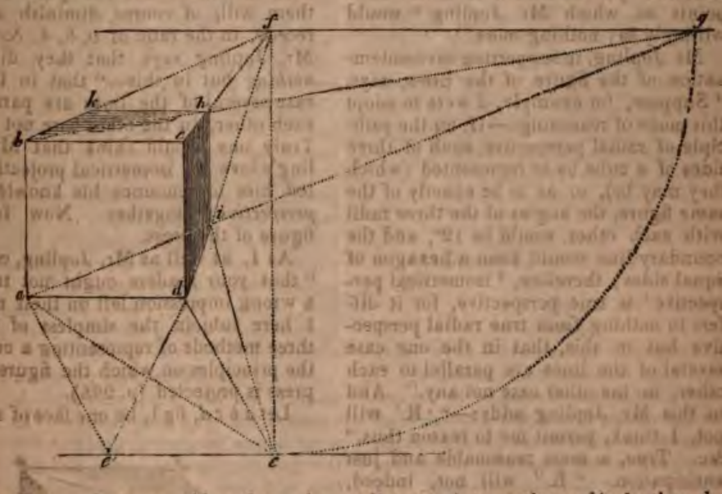
Let *a b c d*, fig 1, be one face of a cube:



draw the diagonals *a c*, and *b d*. Let *b d* be one side of an equilateral triangle, and the other two sides will, of course, meet at *e*; drop the line *e f* parallel to *c d*; draw the line *c e*, and make *d f* parallel to it; draw *g e* parallel to *b c*; and draw *b f* parallel to *c e*. It will be seen that, by measuring on the diagonals, any height or distance may be set off.

There are other, but less simple, methods of projecting a cube in this way, (which differs from parallel perspective by some of the lines being parallel, and by the objects preserving the same size as they recede,) by drawing a line from the centre of one surface to the point of sight, and making the other lines parallel thereto; but the diagram given is sufficient at present for our purpose. It must, however, be remembered, that this mode of representation may have no advantages over isometrical projection, and that the figure of the press was only said to be a different mode of delineation." But Mr. Jopling will still, perhaps, say that this projection is wrong. "For if one face of a right angled prism be projected as a right angled parallelogram, only one other face can be represented, which will also be a right angled parallelogram. Surely Mr. Jopling will admit that it is a law in parallel perspective, that the base (and of course all lines parallel to the base,) of that side of a square object which is nearest to the observer *is* parallel to the plane of the picture, while the other side and the upper surface is seen in the perspective. But let us project a cube in true perspective to substantiate the case.

Let *a b*, fig. 2, be the breadth of eithe



of the six equal square sides of a cube, and *e* the place of the observer. Make *a b c d* a true square, and draw the horizontal line *f g* (the distance of which depends on the height of the object) parallel to *a d*. Objects cannot be seen distinctly under a greater angle than that of 60°, so the acute angle at *e'* is an angle of 60°. From the place of the observer *e* (which is placed on this line at the situation where the person who views the object is supposed to stand) draw the line *e f* to cut the horizontal line in *f*, which is the point of sight.

Draw *b f* and *c f* to the point of sight. Place one foot of the compass in *f*, and describe the quadrant *e g* (this is merely that the distance from *f* to *g* may be the same as from *f* to *e*); then *g* is the point of distance. Draw *b g* to the point of distance, intersecting *c f* in *h*; then draw *h k* parallel to *b c*. Draw *d f* to the point of sight, and *a g* to the point of distance, intersecting *d f* in *i*; then draw *h i* parallel to *c d*, and the operation is finished.

If this latter figure, which is projected on the true principles of parallel perspective, be correct, it follows that the figure of the press is *not* "a false projection;" but if Mr. Jopling thinks that he can prove, in a direct manner, by mathematical demonstration, that it *is* wrong, then I shall strive to conform to that modesty so becoming to youth, and sit down and receive, with docility, the sober lessons of my senior.

I am obliged to Mr. Jopling for his wish to avoid any thing that might "hurt" my "feeling but I can as-

sure him that he need have no fears on this head, and I hope that this consideration will never induce him to withhold his sharpest *lash* in any controversy with me. "The fish that should be miserable because it could not fly, and the eagle that should be disquieted because it cannot swim, would be less silly than the person who is vexed and pettish because things do not happen just as he would have them." But, setting aside *this* part of the matter, I can scarcely allow, on the other hand, that any one will pay much deference to the feelings of another, when that deference would trench on their own interests. I can assure Mr. Jopling that such acts of kindness will be entirely lost on me, as there are few, very few persons that I give credit to for such disinterestednes; and I think that I should be acting very unjustly towards him if I *even* thought that he is so little acquainted with his own nature, and with human nature in general, as not to know, that

> "In all distresses of our friends,
> We first consult our *private* ends."

I remain, Sir,
Yours, very respectfully,
R.

Bayswater, Aug. 20, 1833.

SPONTANEOUS COMBUSTION—LATE FIRE AT THE DUBLIN CUSTOM-HOUSE.

Sir,—The opinions relative to the origin of the recent fire at the Dublin Custom-house, as noticed in your journal, must appear to the generality of readers extremely vague and unsatisfactory. In the first place, Mr. O'Connell, a gentleman employed on the part of the merchants, suggested that "the fire might have been caused by the oil mixing with the wool, and producing spontaneous combustion;" but as cotton and oil only, in whatever proportions they may have been mixed, have never yet been known to ignite spontaneously, why should they do so in the case under investigation? No, nature is all the same, though doctors differ. But had Mr. O'Connell simply allowed the cotton to ferment and inflame, as hay, flax, hemp, linen rags, animal wool, &c., have frequently been known to do, by the agencies of humidity and pressure only, he then might have called in the ten leaky casks of palm oil to assist in burning the tallow casks, and melting and consuming the tallow, and so forth. By thus considering things in their natural order, he might have arrived at something like an explanation of the lamentable occurrence. Now for Mr. Oldham's hasty and unqualified assertion, "that if the warehouse people at the Custom-house had made a pile of sticks, and applied a light, they could not have kindled a fire more effectually than they had done, by allowing oil to leak in amongst *loose* cotton or wool." In corroboration of this opinion, Mr. Oldham stated the particulars of three spontaneous fires which had occurred in the printing-room of the Bank, amongst the oiled rags which had been used to wipe the printing plates, and had then been thrown by in a heap. Surely Mr. Oldham cannot with any degree of propriety draw a parallel between the oiled rags in the printing-room and the oiled cotton in the Custom-house. That gentleman does not seem to be aware, that lamp-black, one of the components of printer's ink, is the basis of some of the most active pyrophori that have been discovered, and when mixed with a preparation of linseed oil (another ingredient of printer's ink), and slightly compressed, the compound invariably takes fire spontaneously. (Vide Sup. Ency. Brit., Art. *Inflammation, Spontaneous*, which contains some lucid observations on the subject.)

Mr. Edmund Davy has experience and science on his side, although he did astonish all who heard him. In fact, until it can be proved that the cotton in the Dublin Custom-house did not contain sufficient aqueous moisture to promote fermentation and all its consequences, it can never be pronounced with certainty that the fire had any other origin than that of spontaneous ignition, resulting from the agencies of moisture, heat, and pressure—that is, admitting it had not been set on fire by the immediate application of some ignited substance.

Q. R. S.

London, August 26, 1833.

CASE IN TRIGONOMETRY.

Sir,—According to a notice given in the last page of the monthly part for May of your excellent miscellany, of Iver Maciver's "Hyding for Hyde," I expected to have seen something from him by way of solution of Mr. Hyde's case in plane trigonometry; but, in the part for June, p. 140, instead of a solu-

tion, I find it is only an assertion "that the thing is impossible." I therefore beg leave to give you a solution, which, I trust, will be not only satisfactory to Mr. Hyde, but convincingly to Mr. Iver Maciver that the thing is both possible and practicable. But Mr. Hyde has acted rather extraordinarily, for on 5th May, 1832, he proposed a question, and in May, 1833, by way of a solution of it, adduces a very different one, taken from Dr. Hutton, with his dimensions and solution, and also with a solution from his own dimensions. He does not seem to be aware that they form two very different cases, one where the object is *accessible*, and the other where it is not so; however, I will proceed to mine, observing that I have selected it as near to that of Dr. Hutton as I could.* And as Mr. Hyde has given his solution from *his own dimensions*, I presume I may be allowed the same privilege, and make use of mine.

First, then, I take the angle A B D 42° 21′; then retreating from the object in a right line down the declivity 60 feet, I take the angle B C D 23° 36′; *and also* the angle A C E 17° 06′. From these dimensions a diagram may be formed correctly. Then, to ascertain the

visionary line B D, I make use of the same method as both Dr. Hutton and Mr. Hyde. Next, it is requisite to ascertain the angle A B D (in order to get at the angle D A B), which is to be done by substracting the angle B D C (already found) from the angle E D C, the complement of the angle E C D. Then, for the height of the object A D, it will be, as the sine of the complement of the angle D A B is to D B (found by the former statement), so is the sine of the angle A B D to A D.

As S ∠ B D C 18° 45′......Ar. Co.......0.492901
Is to B C 60 ....1.778151
So is S ∠ B C D 23° 36′ 9.602438

To D B 74.73 ....1.873490

As S ∠ D A B 107° 06′ ..... Ar. Co. 0.019636
Is to D B 74.73 ....1.873490
So is S ∠ A B D 42° 21′ 9,828,439

To A D 52.67 . . . . 1.721565

Now, Sir, I take this to be a complete answer to the question, and can only suppose that Mr. Iver Maciver's assertion was incautiously made.

I remain, Sir,
Yours obediently,
TEMPORA.

Kentish Town, Aug. 7, 1833.

INDIA-RUBBER BALLS TOO FRAGILE FOR LIFE-PRESERVERS.

Sir,—I presume "Enort" has not seen my letter on the fragile character of the India-rubber balls, at page 419 of your 17th volume, or he would not have suggested the application of them, contained in his letter at p 366 of your last Number. To that communication, therefore, I beg to refer him. Nothing short of *copper* vessels would answer his purpose.

I am not myself much disposed to palliate an evil that requires positive amendment. Let attention be turned to the best manner of increasing the stability of wherries, without adding too much to the labour of working them. Perhaps a shifting keel might be employed with great advantage—the value of this contrivance to small sailing boats is strangely lost sight of. When the march of im-

* The reason I have not taken the same diagram and dimensions as Dr. Hutton's is, that having attempted to lay the former down by the latter, I find *that they are very incorrect, and will not agree,*

provement takes to the water, perhaps wherries may come in for their share: at present there is a wide field open for the exercise of ingenuity and skill, both in the construction and working of them.

I remain, Sir,

Yours respectfully,

WILLIAM BADDELEY.

London, Aug. 27, 1833.

PETERBOROUGH-COURT CONVERSAZIONE.

Aug. 31, 1833.

[Concluded from page 400.]

Enter Miss Harriet Norwich, with her friend the gentleman in the domino.

Editor.

Miss Norwich! You do us honour. I am delighted to see you—your friend also, albeit he comes in so questionable a shape. To be friend of Miss Norwich is passport sufficient to any society.

Miss Norwich.

You are pleased to be complimentary, Mr. Editor; but if I may judge from the treatment I have just experienced, there are those here who would have been much better satisfied had I remained away.

Editor.

I have heard, Madam, all about it, and am not surprised that you should have thought the conduct of your cousin Rattler and his friends, in leaving you so abruptly at Holland House, extremely rude; but had you been here a little sooner you would have heard all this satisfactorily explained. The fact is, there were some gentlemen on the carriage who have made themselves rather notorious for their hostility to your friend the Chancellor, and they did not relish the notion of being shown up (as it were) for the entertainment of one they esteemed so little, and have attacked so fiercely. It was they who forced the carriage to proceed without you.

Miss H. Norwich.

Indeed! But wherefore, pray, this hostility of theirs to the Chancellor? I have been told, Sir, that you never assemble here but to talk scandal of his lordship. How is this?

Editor.

Scandal, fair lady! That is a harsh word. We are "exact science folks," and take "truth" for our motto. You had better ask Junius here if it be not so.

Miss H. Norwich.

What! the man who writes in a dead man's shroud. I despise all such people. I never write any thing that I am ashamed *to put my name to.* Let me talk, however, to the man. He is the same who has taken an especial fancy to the working classes—is he not?

Junius—coming forward.

I am that wight, lady, and have long desired to look upon you. As for your reproach, that I use no name, my answer is—What if I have none? What if I be a factory victim, a supernumerary in the world, left by unknown parents, too poor to bestow a christening fee? *Nominis Umbra* was less likely than any one to sue out a caveat against me, and therefore I appropriated his name. He dared not prove his title, and therein was my hope of resting quietly in possession, like a land crab in the West Indies, with a spare shell not grown on his own back.

Miss Harriet Norwich.

And so you think it necessary, for your part, to abuse my friend the Chancellor, in order the better to keep up your friendship with the working classes.

Junius.

You mistake, lady. I do not abuse, I speak the truth. Did I not, they are not few who would willingly gainsay me.

Miss Harriet Norwich.

Yes, the Chancellor has many friends.

Junius.

For *friends* read *hangers on.* Men—aye, and *women* too—ready to sycophantise him, in hopes of personal advantage.

Miss H. Norwich.

I perceive, Sir, to whom you allude, but I scorn your imputation.

Junius.

I impute nothing, lady. Earnestly do I wish that you would look through the hollowness of the Chancellor, and betake yourself still more earnestly to the cause of the people.

Miss H. Norwich, haughtily.

Sir, whoever you may be, you presum . A little more deference, methinks, were proper. Remember who I am—my family, Sir. Ever since the days of the edict of Nantes, when they first emigrated from France, "my family has maintained an honourable station in society, the eldest sons alwas practising surgery, the others devoting themselves to commerce or manufactures."

Junius.

Aye, I could have sworn it. True Celtic origin on both sides. Strong intellect to mark facts, but absence of the judgment necessary well to use them. Feeling—vivid but transient, and vanity and anger, from time to time predominating. The perception to glean knowledge, and the skill of the painter to set it forth; the power of assimilation, but not that of originality. Would that your Hugonot progenitor had been grafted on the noble

Saxon stock, like the family of Rowland Detrosier.

Miss. H. Norwich.

Sir, I beg you will not name me in the same breath with such people. Had the person you mention possessed any remarkable qualities, do you think my friend the Chancellor would have failed to discover them?

Junius.

Perhaps not. But when discovering them he would take especial care not to place him in a situation where his qualities would be useful, for fear of being himself eclipsed. But why use the word "person" with such emphatic morgue? Surely Rowland Detrosier, or Roland of the Rosebush, if duly dignified by place and profit, would be held a remarkably engaging name, even amongst the slips of aristocracy. Even the ancient families of Norwich would scarcely doubt its undeniability.

Miss H. Norwich.

Pray, Sir, what may you mean by these inuendoes?

Junius.

Nay, lady, my meaning is plain enough. You cannot serve God and Mammon.

Miss H. Norwich.

Explain yourself, Sir.

Junius.

If you would truly serve the cause of the people you must cease to join grip with those whose sinister interest lies in oppressing and cheating them. You must rely on your own powers, and cease to be cajoled by designing plausibility.

Miss H. Norwich, with warmth.

Sir, I take my stand upon SCIENCE, and am cajoled by no one. All political parties want to make prize of me, but I stand alone.

Junius.

You did once stand alone. Did the Diffusion Society *then* help you? Did Henry Brougham then patronise you, when subscriptions were solicited for your writings? But you were not all alone. The approbation of the good and the wise, to whom you were known, was given to your undertaking. You struggled with difficulty, you urged your spirit on to the task, and you succeeded—you triumphed. Then it was that Henry Brougham, whose "Diffusion" had spurned your offers, and contemned your manuscript, saw that you were likely to be of importance; then it was that Henry Brougham put forth his emissaries, his crawling creatures accustomed to jobs of all-work — who will "ride more miles for half-a-crown than a postboy," when his bidding is in question —and you were taken in the toils. You were bewildered. Your intellect served you not, and you deemed, like Johnson or Walter Scott, that the condescending patronage of a lord ought to be handsomely acknowledged on the part of all writers.

Miss H. Norwich.

This is mere assumption on your part, Sir.

Junius.

Nay, lady, affect not to deny it. It is the common talk of every printer's devil —of every living soul, in short, connected with print or manuscript.

Miss H. Norwich.

Well, Sir, what is it to the public, that I choose my associates amongst the nobility, gentry, and quality in general. My writings sustain no alteration thereby.

Junius.

But their sale, and their power, and their utility does. Why has your new series fallen still-born from the press? Why but that the "Diffusion" contact has poisoned them in the estimation of the people? They are a species of quack mental physicians, who have been found out by the people to be little better than poisoners, and therefore they will not trust those who compound drugs for them.

Miss H. Norwich.

It answers my purpose to keep well with the Chancellor. I thereby get access to stores of information which I could not otherwise procure, which are of incalculable advantage to me in my writings.

Junius.

Lady, you are jesting. Surely you must be aware that this is a joke amongst all parties. What! access to the Reports of the Commissioners of Poor Laws seven days and some odd hours ere the volume was published by Fellowes, for all such of the public as chose to buy it at the price of four shillings lawful money of the realm!!!!

Miss H. Norwich.

Sir, this is a vulgar joke.

Junius.

But not the less true, lady. How is it that you can thus suffer the false importance of official knaves to obscure your intellect, which is so immeasurably superior to theirs? How suffer yourself to be gulled by them so egregiously?

Miss H. Norwich.

Sir, I am not gulled. I see through them all.

Junius.

Not so, lady, or you would not be turned from the straight path.

Miss H. Norwich.

How mean you, Sir?

Junius.

You would not abstain from writing usefully in periodicals, because "Grey requested me not, as he said it was

'respectable.'" Neither would you suffer your actions to be guided by Henry Brougham. Nay, you would even resolve to visit the American Union, if it seemed good to you, without thinking it necessary to inquire—"if the Chancellor can spare me." Lady! lady! you are far too good to be the gull of such ancient Poloniuses. Shake them off, and stand erect in your own might.

Gentleman in the domino.

Sir, this is an unmanly libel. You should remember that the person you speak of is a woman!

Junius.

Sir, I do not forget it. I am no Conservative to consider political rancour an excuse for the dereliction of all delicacy. She is a woman, and possesses talents superior to many women—therefore is it that I would fain have those talents turned to full account, and not blighted by the breath of mistrust, and their utility to the people thus lessened. Tell me, lady, does not your conscience smite you with the evil desire to kick down the stool by which you mounted? Never shame to acknowledge the error. Persisting in it will convert it into a crime. "Know thyself!" Taking lessons in behaviour from the sage of the "Middle Ages," in order to acquire a pretty comportment for the "circles," will not constitute true dignity.

Miss H. Norwich.

Who told you of this, Sir?

Junius.

Why the tale is "common as the stairs that mount the capitol;" common as the phrase "Brummagem Bacon." Again, I say, arouse yourself. Shake away the base and unworthy things from around you, and stand erect in honour.

Miss H. Norwich.

I am treated with all honour and respect by the "circles" whenever I go amongst them.

Junius.

To your face. But the reptiles who to your face affect to honour you, in order to draw some advantage from your pen, speak of you behind your back, as the "young person who writes the books;" sneering at mind in their conviction of the superior importance of station.

Miss H. Norwich.

I will not believe it.

Junius.

You will find it, ere long, but too true. Since you rose into note you have not been accustomed to hear the truth. I do regard you as bearing a "mission" in the task of instructing the people: I therefore say to you, as the daily wakener of the Duc de St. Simon said, "You have great things to do," Arouse yourself from the lethargy into which your insidious advisers would fain plunge you. Collect your better feelings; take a high tone of moral dignity, and rise superior to the base things who would shrink away from you were you in any way dependent on their aid. You are at present gulled by quacks, who assume to themselves the credit of directing your labours.

Miss H. Norwich.

Quacks, Sir!

Junius.

Aye, quacks, lady. If you doubt me, ask Henry Brougham about the Treatise on Hydrostatics, and the manner of its concoction. Waste not your time upon such people, for the sake of the repute of newspaper paragraphs. Cease to act in the spirit so well pourtrayed by the bard of Avon, when he represents a certain courtier as seeking greatness in the phrase —"the King's poor cousin, Sir."

Gentleman in the domino.

Really this is too bad; I think, Madam, we had better leave.

Miss H. Norwich.

Oh, I see whence it all arises: he is envious of my celebrity as a writer.

Junius.

Envious! Alas! you know not my spirit, lady. You know not how I have rejoiced in your powers as an instrument of good to your fellows. You know not the intense glow of exquisite joy which has from time to time thrilled my heart while reading your writings. As Burns would have said—"Ye'll aye wile the vera tears frae mine een wi' your clavers." Oh! I have marked you as fitted to be one of the band struggling for the regeneration of their race. Deeply have I rejoiced in your excellence; deeply have I grieved over your failings, which serve to narrow your sphere of utility. When I read the first number of your series, I marked your deep knowledge of human emotions, and I said within myself, "here is an instrument of power." That scene of the gradual softening of the long-seared heart of the calculating man of trade—that breaking down of hardened pride before the gushing outpouring of the latent feelings of humanity, was most truthful. I blessed you for it. Envious! You know not my spirit. I beheld in you the means of impressing the community with the names at least of those principles on the knowledge of which their ultimate happiness must depend, and against which their hearts had been turned by more than one vicious yet plausible and popular writer. I saw that the science of human happiness was about to be unfolded in an agreeable mode, which would tempt the public to try to understand it. I was not amongst the number of those

who believed that all the world would be magically enlightened the moment that knowledge was placed before them. I knew that the power of assimilation was also requisite, otherwise the remarkable exposition of the circle of sciences, on whose principles human happiness must ever be built up—which James Mill put forth, thereby evidencing the giant power of a single human mind—could not have lain so long in comparative obscurity amongst the mass of the people. The painting and sculpture of writing were necessary to make its logic and geometry likeable, and this ornamental work you furnished. Your writings were liked for their feeling and picturesque effect; and the result will be, that many of those who have read them will ultimately study the principles on which they are founded. The power you have thus wielded has been great, but it has not yet penetrated amongst the mass of the people. The "middling" class have been your readers hitherto; and now that your name is becoming known to the working classes, your power is withering by the accompanying knowledge that you are, as the phrase goes, "bought and sold by the Diffusion Society." Shake them away, lady; shake them unequivocally away, and you shall wield a power greater than ever William Cobbett did, and of a more magnificent kind. He led only ignorance in his leash, but you shall be the adviser of reasoning and intelligent beings. Do this and you shall be the benefactress of your species. Hesitate and you will be like a withered ash, which stretches forth its leafless boughs, and serves only as a landmark on a barren wilderness.

Miss H. Norwich.

Mr. Editor, as I did not come here to be lectured by people inferior to myself—people whom nobody knows—I shall take my friend's advice, and retire.

Exeunt Miss H. Norwich, and the Gentleman in the domino.

Editor.

Junius, have you not been too hard upon this lady?

Junius.

Too hard upon her temper, not upon her reason, when it returns to her.

Editor.

But consider her sex.

Junius.

I do; and that she is by far too good to be flattered and wasted, as is the case with too many of her sex.

Dubious.

But is what you have said of her all true?

Junius.

If you doubt me, ask of the literary circles. Oh! it grieves me that a b[illegible] possessed of many useful qualities should destroy their good effect by frivolity.

Editor.

That is an excellent portrait of the lady which is in the shops, by Margaret Gillies. There are few artists who produce such expressive likenesses as that clever young lady: she seems almost to paint the very thoughts of the brain.

Dubious.

Yet not so well but that she leaves much to be said to make the portraiture of character complete. I wish Junius would try his hand at a fuller delineation of the fair subject of our discourse. He seems to have studied the lady thoroughly.

Junius.

Most willingly: Miss H. Norwich may be said to be an appropriator, rather than an originator, and therefore not, in the true meaning of the word, a genius. Her memory is extraordinary. It is like that of Macaulay, a perfect storehouse of all kinds of strange matters of knowledge, fag ends of rubbish, masses of science, technical smatterings, scraps of old ballads, facts from all kinds of books, and persons, and things, jumbled up like a marine-store shop, in hideous confusion. She herself does not know exactly what her brain contains, but she hedges it round so that nothing may escape from it: she will learn any thing from any body, and put it by, like a buyer of bargains, to keep it seven, fourteen, or twenty-one years, till she can bring it into use, after the fashion of the old proverb. Nothing is too hot or too heavy for her, if it may only be "acquired." The dulling of one sense by accident has sharpened her other faculties. Her eye is so acute that she will take an instantaneous and accurate measure of every person and thing that may fall within her sphere of vision, and as instantly is the remembrance packed away in her brain, not to be again called forth till wanted. Her brain, in short, is one huge commonplace book. She will study a science, and understand its principles, but she lacks the power of judgment for its due application. She has not the grasp of mind which constitutes a discoverer by induction. She finds things more because they fall in her way than by diligent seeking for them. In short, she is not a philosopher, and thereby she loses half her power in the application of her knowledge. She is no inventor. She never wrote a fact that you could dispute as improbable with any chance of success; for she could quote time and place for every fact she ever described. Her business is with emotion, not with judgment; but that emotion is individual, not general. Her general benevolence in her writings is a principle,

not a passion. Her nature is good while her temper is bad, and the latter frequently induces her to do things which the former condemns. But her moral courage is magnificent: she dares do any thing which her reason is convinced it is right to do; aye, and she dares do this in opposition to all the cant of pseudo "respectability." This is a noble quality, and most peculiarly fits her for the business of a teacher of the people. My heart warms to her for this noble firmness of mind. Then she is truly honest in her belief of what she writes, and her manner of individualising emotion is perfectly exquisite. Music will thrill upon her nerves till she will cry like a weaning infant; yet in the next half hour she can find time to tomahawk a neighbour, who may chance to offend her, with merciless fury. But the rock on which she splits is vanity. It blinds her, and she cannot see that she is forsaking the station of true honour to get pricked up like a May queen of the "black bands." She won fame by the exertions of her own mind, and is weak enough to deem she is reaping its fruits by the patronage of such men as Henry Brougham, who laugh at her when her back is turned. She talks of her family respectability, and then, unlike Carstein Neibuhr, she dishonours her family by aping "quality airs." It is no uncommon failing: many philosophers have laboured under it. Davy thought less of his science than of his knighthood; Cuvier, after dissecting the world, imagined that there was power residing in the word baron; and numberless other instances might be adduced. To tell the lady of these things may offend her, but her peculiar organisation forbids the chance of the matter being wasted. She cannot choose but remember it, and the effect will gradually be produced when she gradually finds the hollowness of what she now seeks so earnestly. In men of physical science, setting aside the loss of time, the sycophantic propensity is comparatively harmless, but in a moral teacher it is mischievous. The people have been so often cheated that they are apt to be suspicious; and Miss Norwich, blinded by her vanity and love of lords, does not see how she is weakening her influence. There is no evil intention in her—nothing but bewilderment, which will pass away in time; and meanwhile those who value her utility must endeavour to avert the suspicions of the people. But is it not ludicrous to think of "Middle Ages" becoming gentleman usher to the new literary star, to teach her whom to seek and whom to shun, and what periodicals to avoid reading, being considered "low" in the circles. Well, well, she is working out her character, and will eventually cast her slough.

Editor.

Well, we will hang her portrait in the hall of our Conversazione as one of the elect in the work of regeneration. If she prove recreant to the great and good cause, we will afterwards move for its expulsion.

Junius.

My life on it she will not. Reason will conquer frivolity: if it does not the fate of Henry Brougham will be hers—to be scorned by the people over whose minds he might have ruled.

Supper announced and all retire.

MR. MALLETT AND THE STONE-SPLITTING SCREW.

SIR,—I trust you will permit me a few observations upon your editorial remarks, on my reply to "ϕ. μ." You say, "You see no occasion for so much warmth." Is there no need of warmth, when a man esteems himself rashly and falsely accused of pirating an invention—in other words, of deliberate and wilful deceit and falsehood?

In defending "ϕ. μ." you somewhat mistake the facts; you say "ϕ. μ." states, that in a certain paper, &c., there was a suggestion thrown out, which SEEMS to have suggested to Mr. Mallet the idea of his stone-splitting screw. Now, Sir, "ϕ. μ." does not say any such thing: he says *positively it did suggest* the screw to me; nay more, he says, he will take from me by anticipation the possibility of a reply to his charge.

Here, Sir, we contend, not concerning any suggestion, not on any point of inventive genius—he does not accuse me of having produced a mechanical blunder, but he asserts I have been guilty of falsehood, of a breach of personal honour. When, therefore, "ϕ. μ." brings *my personal character* before the tribunal of the public, he has a right to appear as accuser in *his personal character also*; otherwise it is as though of two duellists, one should fight, *assassin-like*, in the dark, the other exposed to the light of day. Is it considered consistent with British jurisprudence, that the accused should not know who is his accuser? Nay, are they not confronted face to face?

You say, "Suppose a real name had been given, how could that affect the suggestion itself? Clearly not at all, since anonymous writers may be pillaged as well as those that give both name and sirname." Possibly all this is true, Sir, but it is not the question. We are not considering whether and how far the veracity and authority of a man's writings are concerned by his name being appended to them or not, or when they are most liab

to be pillaged; but whether a man, who accuses another to the public of a breach of honour, of a derilection of personal character, acts as a gentleman in withholding his name. I say certainly not; for what is the object of suppressing his name in such a case? Is it not that, in the contest about to ensue, the shafts of public execration (should the accuser be found a false one) may, instead of striking their object, fall upon an empty shade?

You say truly, "the good or evil of anonymous writing depends upon the use to which it is applied: it may be either the veil of modesty, or the crape of the robber."—To him who would rob another of his fair name in disguise it certainly is the latter.

I must entirely absolve you, as editor, of any participation in the guilt of "$\phi. \mu.$," notwithstanding that your anxiety to defend him has made you fancy yourself a "*particeps criminis.*"

I know not whether you will insert this or not, for editors occupy rather a formidable situation, when they unite in themselves the inconsistent offices of advocate and judge; but if you are ruled by justice you will insert it.

As to whether "$\phi. \mu.$" be near me, or remote, you and he may rely upon it there is nothing I have said of him that I am not ready and willing to repeat to his face.

I am, Sir,
Your very obedient servant,
ROBERT MALLET.

94, Capel-street, Dublin, Aug. 17, 1833.

COOKING BY GAS—ANONYMOUS WRITERS, AND A FEW OTHER MATTERS.

Sir,—Mr. Mallet's plan for cooking by gas, as detailed in the Mech. Mag., No. 521, is very ingenious, and undoubtedly very effective. I fear, however, that the first cost of the apparatus, and the subsequent expense of the process, would operate as a prohibition amongst the great mass of gas consumers. I do not quite understand whether the gas was driven through the concentric orifice of the jet by the ordinary working pressure at the gas works, or by additional pressure employed on Mr. Mallet's own premises. That is rather an important circumstance as affecting the quantity of gas consumed in a given time.

The imperfect combustion of gas (at a blue flame) I noted some time ago, (Mech. Mag. vol. xviii. p. 333) as a defect in the plan adopted by Mr. Hicks. Since then I have seen that gentleman's apparatus in operation: it merits the attention of all who feel interested in such matters. That it is susceptible of some material improvements will not, I suppose, be denied. I earnestly hope Mr. Hicks will persevere in his exertions. He has my hearty wishes for his success.

A SIMPLE AND UNEXPENSIVE APPARATUS FOR HEATING AND COOKING BY GAS IS STILL A DESIDERATUM.

How very sensitive Mr. Mallet is, Sir, about his inventions! His late attack (Mech. Mag. p. 249) on "$\phi. \mu.$" in reference to the stone-splitting screws, was unnecessarily severe. The end does not always justify the means. Mr. Mallet did right in asserting his claim to priority, but a simple statement of the facts would have entitled him to quite as much consideration from your readers as the exhibition of so much wrath. I fear "$\phi. \mu.$" is suffering from ill health. Mr. Mallet must pardon me, but I cannot help saying that I hope "$\phi. \mu.$" will not let him off without a suitable admonition. Are we not all engaged in the common cause of driving from its strongholds the common enemy of the whole family of man—*ignorance?* Are we not all occupied in the search after that heaven-born science—Truth? Suppose we do, by taking different routes, now and then cross each other's path, still the world is wide enough for all. Let us not fall out by the way. If we know and feel the value of time, we shall find no leisure for wrangling. There is work enough for us all to occupy the brief hours of human existence. Should we commend the workmen who would be often throwing down their tools to pelt each other with chips or brick-bats? Surely we should view such conduct as indicative of something worse than idlenesss.

Mr. Mallet has intimated that Professor Daniell copied from him his concentric gas-jet.* It seems to me very likely that the invention was quite as original in the hands of Mr. Daniell as in those of Mr. Mallet. Instances of this kind so frequently occur that we cease to wonder at them.

It is very humbling to human pride, but it seems a wise ordination, that important discoveries and useful inventions

* Philosophical Magazine, Jan. 1833, p. 57.

should often be originated by different individuals at a distance from each other, in some cases simultaneously, in others at an interval of many years, but yet without any previous knowledge of each other's operations. It is he who first makes public his discovery or invention that merits the thanks of mankind. Priority of invention, in point of time, is not in itself of any value unless its benefits be diffused.

In the cases to which I just now alluded, viz., the stone-splitting screws, and the concentric gas-jet, "$\phi.\ \mu.$" is doubtless *an* original inventor of the former, and Mr. Daniell *an* original inventor of the latter. Can Mr. Mallet desire to be more than *an* original inventor? How would he satisfy himself, if he were desirous of doing so, or how would he convince the world that he is the *first* inventor of either or both of these articles?

Your able correspondents, Messrs. Mallet and Badnall, have complained of late of the anonymous contributors to your Magazine. If those gentlemen would look at the matter in all its bearings, I think their objections would abate, if not entirely cease.

Ought the name of the writer to constitute the only standard by which to estimate the value of his communications? If a paper be good, is it not equally good with a fictitious, as with a real signature? And if it be good for nothing, will the sirname of the writer, and lots of christian names, such as happen to fall to my share, thrown into the bargain, render it valuable? To be sure it must be very gratifying to one's curiosity to know that Mr. Mallet wrote a certain paper, and that Mr. Badnall, and Mr. Cheverton, and Mr. Dakin, and Mr. Baddeley, and Mr. Shalders, and so on through all the list of Misters, wrote certain other papers! But after all, what beneficial result attaches to this species of gratification? Are not the writings of Mr. "A. B. C." or Mr. "X. Y. Z." or Mr. "$\phi.\ \mu.$" or Mr. "Junius," (himself a host!) deserving any attention?

The magic-in-a-name system, which with many persons is the only rule of judgment, and the only criterion of excellence, indicates an enslavement of the mind inimical to the healthful and vigorous exercise of its faculties. But is it not worthy of remark, that we rarely, if ever, hear any complaint against your anonymous contributors, Sir, until they commit the heinous offence of objecting to something that has been said by a less scrupulous writer? Then, but not before, the discovery is made, that an anonymous writer has no claim to the courtesy and kindness usually shown to strangers in respectable company—that whatever may be his talents, his profession, or his rank in society, he is like a dog with a tin-kettle at his tail, and may therefore be pelted and abused without pity or compunction!

It cannot be denied that on many occasions it is not only desirable, but almost imperative, that a writer should attach his name and address (or at any rate place them in your hands, Sir,) to his communications. These instances relate, however, to the facts and phenomena of science, more than they do to those useful hints, speculative inquiries, and abstract discussions, which occupy, from time to time, so large and so valuable a portion of your Magazine.

Those who write anonymously escape the infliction of long letters, which sometimes take both time and money from their less fortunate brethren.* But never mind: perhaps we may manage to profit by the loss.

"F. H." says, page 274, that "a project is nearly completed for simplifying the process of gas manufacturing." May I ask "F. H." to tell your readers something more about this improvement. Is it a scientific or a legislative process?

J. O. N. RUTTER.

Aug. 15, 1833.

THE "SUBSTITUTE FOR THE CONNECTING-ROD IN STEAM-ENGINES."

Sir,—From the manner in which "S. D." introduces "the substitute for the connecting-rod in steam-engines," at page 362, I am perfectly satisfied that it is an original contrivance with him; but I think it right to put him in possession of the following information on the subject.

The idea of converting a reciprocating motion into a rotary one, by means of a crank traversing in a groove, *is by no means a new one.* It was employed by

* I lately received a letter through the publication of my name in the Magazine, that contains, on a fair calculatson, as much matter as eight or nine of your page

Mr. Tyrer in his patent pump, a description of which may be found in "Nicholson's Operative Mechanic," and several other works. A very good explanation of this movement will be found at page 57 of the Second Treatise on Mechanics, published by the Useful Knowledge Society, where some of its defects are also briefly alluded to. I have seen some garden-engines, in which the piston was alternately raised and depressed by a contrivance of this kind, the power being applied to a winch. I made a model of this engine about eight years since myself. This method of converting vertical into circular motion, is not, however, very generally resorted to, on account of the *friction*, which is so excessive as to more than counterbalance any advantage that can be obtained by using it. There are several other methods of effecting the same object in a much better manner than by the crank sliding in the transverse groove.

I am, Sir, yours, respectfully,

WILLIAM BADDELEY.

Aug. 27, 1833.

"THE ECLIPSE" IN COURT.

We have received the following letter:—

"Sir,—I am instructed by Mr. David Redmund, of No. 68, Charles-street, City-road, iron-founder and engineer, to inform you, that in consequence of an article, headed "Peterborough-court Conversazione," having appeared in the Mechanics' Magazine for Saturday, August 31, 1833, in which unfounded statements and remarks are made, evidently directed against himself as an engineer, and particularly as regards his advertisements to supply steam-carriages, now and lately in course of publication in the London newspapers, and calculated to do him serious injury with the public in the way of his trade; purporting, as the article in question plainly does, that he who is advertising to supply steam-carriages to the public, has constructed and started one which has failed in consequence (amongst other innuendoes) of its having 'a wretched bad engine,' *the fact being that no steam-carriage has yet been started by Mr. Redmund*;—I have his instructions immediately to proceed against you as Editor and Proprietor of the said Mechanics' Magazine, for the recovery of damages, as well on account of such mischievous and unfounded statements, as of the special damage he has already sustained, and may hereafter suffer, in consequence of such imputed failure, and other misrepresentations, by the interruption of contracts in progress of completion, consequent thereon. You will, therefore, oblige me by a reference to your solicitor, in order that the unpleasantness of personal service of process may be dispensed with.

"I remain, Sir,

"Yours, obediently,

"GEORGE MOUCHET."

"Steam-Carriage Company's Office,
68, Charles-street, City-road,
September 3, 1833."

We have readily furnished Mr. Mouchet with the "reference" he requests, and entertain but little apprehension as to the result of the action he has been instructed to bring against us. We do not therefore publish this letter with any view of averting the legal visitation with which we are threatened, or of discussing the validity of the reasons which it contains for Mr. Redmund's singular course of proceeding; but simply that we may satisfy our own sense of justice in regard to the matter. It will be seen from Mr. Monchet's letter (assuming that the statements in it are correct), that his client, Mr. Redmund, has been "advertising to supply steam-carriages to the public," and that there are persons who have taken it into their heads that the Eclipse steam-carriage, whose unfortunate adventures occupied so prominent a place in our last "Conversazione," is to be regarded as a specimen of his skill in this branch of manufacture. Now we think it but fair both to Mr. Redmund and to the public, that the fact with which we are here made acquainted should be made as universally known as our pages have made known the merits and adventures of the Eclipse, namely, that "*no steam-carriage has yet been started*" by *the* Mr. Redmund, who is "advertising to supply steam-carriages to the public," and that, of course, it could not have been Mr. Redmund who built the Eclipse, which was supplied with the foul water, which caused the cylinders to prime, which caused the yokels to laugh, &c. &c.—ED. M. M.

Mr. Rutter's Grand Discovery—"If real," says an esteemed correspondent, "it will change the face of the world. To convert water into fire has been long a favourite speculation with philosophers, though hitherto the practical means of accomplishing it have constantly eluded their research. Among others who have distinctly prefigured the discovery, and one of the greatest advantages to be derived from it, namely its application to steam navigation, I may mention your ingenious friend, Junius Redivivus, who, in his 'Tale of Tucuman,' has these lines:—

'Combustion's principle resides in water,
And if we decompose it, hydrogen,
Thus gathered, may be used as burning matter
To drive our merchant prows across the main.'"

No accounting for Tastes.—"The apartments of the weavers are good; but those in the spinning mills are, as it appeared to me, the dirtiest and most low-roofed we have yet seen, several of them very damp, windows so constructed that they cannot be opened, and the smell of the whale oil and tar very disagreeable. I complained to Mr. Wilson, jun., of the bad air and the smell, as being to me almost intolerable; but he treated my complaint very lightly, telling me that the smell of oil was peculiarly healthful, and that he preferred it to that of the carnation."—*Factory Report.—Mr. Stuart*,

of Messrs. Wilson and Co.'s Woollen Mills at Bannockburn.

Bristol and London Railway.—A Committee of Deputies, appointed by the public bodies of Bristol, to consider of the expediency of the proposed Railway between that city and the metropolis, have made so favourable a report upon it that at a public meeting of the inhabitants, held on the 30th of July last, it was resolved to establish a Company forthwith, to carry the project into effect. The Railway will be from 115 to 120 miles in length, and is estimated to cost 2,805,320*l*. It will go right through Bath, after quitting which it will pass near Chippenham, Wootten Basset, Swindon, Wantage, Abingdon, Pangbourn, and Reading, and terminate either at Paddington or some part of the southern bank of the Thames, as may be hereafter determined. The engineers employed in the preliminary surveys are Mr. Brunel and Mr. Townsend.

Effect of Taxation on Morals.—"I was much disappointed, in my progress through Upper and Lower Austria, where the farmers are said to be such a happy, well-governed race: I really saw no such supereminent prosperity—no such superiority over the Bavarian peasant. On the contrary, the Bavarian's condition is superior. The latter has a good beverage, is well-fed, and drives a better team a-field, and a better vehicle to market, than his neighbour. The Austrian, within the last thirty years, has been driven by taxation from wine-drinking to beer drinking—a manifest deterioration in a wine country. Then the Bavarian, if he drinks beer, has good, honest beer; whilst the poor Austrian, where the compound is doubly taxed, pays far dearer for trash. What is the consequence? Why, that the Austrian takes to spirits—the Bavarian never. I have now traversed Bavaria in every direction, and I never saw a glass of spirits before the peasant. Why? Because his beer is good, and of the six kreutzers he pays for a quart, the government takes but two. The Austrian pays eight or nine for the poorest small beer, and the government takes one-half, or more;—and what is the consequence? Cross the frontier from Bavaria to Austria, and spirits instantly reappear as the poor man's beverage. The same story precisely is to be told of tobacco, another luxury of the poor—good and cheap in Bavaria, dear and detestable in Austria. Nor are these things to be despised; for if a people's religion be the first important consideration, their beverage is perhaps the next."—*Correspondent of the Times.*

Taxes on Paper and Glass.—"A Special Juryman," adverting to our remarks on the vexatious character of these taxes (page 267) says, "I have heard the several frauds on the revenue detailed and proved on oath in the Court of Exchequer. I therefore know that the restrictions and penalties are absolutely necessary if the revenue is to be collected. * * * It would be well, no doubt, if the checks and restraints could be removed, but it is first necessary to make man honest. As long as men try to cheat government, the latter must endeavour to prevent them." The writer does not seem to perceive that this only furnishes another strong objection to the taxes in question, since it comes all of their severity that they thus tempt men to play the rogue. The question is, not whether the revenue shall be collected or not, but whether an equal and even greater amount of revenue could not be raised in a way less injurious to the industry and morals of the people?

Eastern Intellectual Society.—An Institution with this name has been commenced in the eastern part of the metropolis, for the cultivation of scientific knowledge. It holds its meetings for the present at Mr. Peacock's academy, Gloucester-terrace, Cannon-street-road.

Journeymen Mechanics.—"The men in this country whose voices loudest and longest sustain the cry against injustice are the better sort of mechanics. Their situation has many moral advantages. If good workmen they are far less dependent than the small shopkeepers. They are under less temptation to servility. They read, think, and associate more than the trading class, and more with reference to public objects than any class. They are out of the great aristocratic current. The want of capital debars them from the prospect of becoming masters. The individual can scarcely be benefited but by public measures which will benefit his fellow-labourers. Hence he attends to public measures. His chief selfishness is that "he will stand by his order," as Mr. Brotherton nobly said in the House of Commons on the Factory Bill, and as we would willingly forget that any body had ever said before him."—*Monthly Repository for Sept.*

Musical Operatives.—"The workers here seemed very healthy and happy-looking. A few of the male workers have formed themselves into a band of instrumental music, who were, on account of their proficiency, I presume, allowed a whole day while we inspected the work, and serenaded us while there, and from the work to the pier where we re-embarked."—*Mr. Stuart of the Rothsay Cotton Mills—Factory Report.*

The Scientific and the Commercial Spirit.—Some time back an English gentleman wished to purchase some cuttings of vines in the *Jardin des Plantes*. He was told that if his application were backed by some known scientific people in England it would be attended to. He quickly procured the recommendation, and the plants were packed by the servants of the establishment, and forwarded gratis to England. The Englishman wanted to pay for them—'No.' He then wished to pay the servants for their trouble—'No—it was for the honour of the nation.' He then remarked to the French botanist, that such things would be paid for in England, when the Frenchman replied with a shrug—'True, but then you are a *commercial* nation.' The spirit of commerce, carried to extremity, is indeed the curse of England. Human improvement is lost sight of in the prospect of commercial gain.—*Junius Redivivus—Monthly Repository for September.*

INTERIM NOTICES.

We hope to publish Mr. Badnall's reply to Mr. Cheverton, &c., in our next Number.

It is not considered by well-informed persons as at all likely that the Bill alluded to by "A Constant Reader" will be again introduced. He had better therefore wait.

R P. We believe there has been something of the sort already done by a contemporary journal. We shall see how this is, and then decide.

Mr. Hinton would oblige by sending to our office for a note addressed to him.

Communications received from R. P.—Sussexiensis—Mr. Waldron—Albus—Emilius—R. Winkworth.

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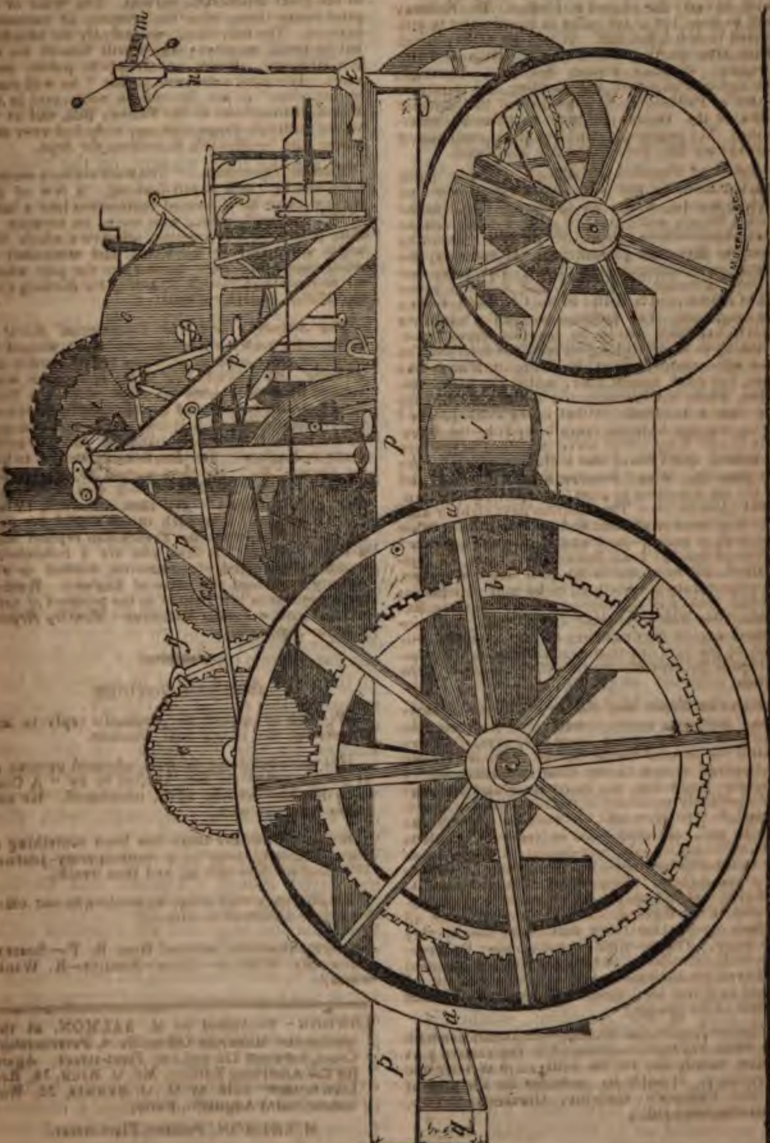
HEATON BROTHERS' STEAM DRAG.



HEATON BROTHERS' STEAM-DRAG.

Sir, — Agreeably to our promise, a short time since, we enclose a sketch of our steam-drag, and also a short description of it.

Having repaired the damage done at the foot of the Lecky Hill, we determined to try the same place again. Accordingly, on Wednesday morning, Aug. 28, at six minutes past ten o'clock, we set out from our manufactory in Shadwell-street, with a stage-coach fifteen hundred weight attached to our steam-drag, with fifteen people thereon, and took up five others on the Bristol road. With this load we arrived at the Bell inn, Northfield, near seven miles, in fifty-six minutes; stopped there nine minutes for water, and reached the Rose and Crown, at the foot of the hill, eighteen minutes before twelve o'clock. Remained there four minutes, and commenced ascending the hill, which is about seven hundred yards long, and rises on an average one yard in nine, and in some places one yard in eight. In many places, too, the ground is so soft that the wheels carried a hill of sand before them of near three inches deep. This hill was ascended by the machine, taking the coach and nine persons to the summit, in *nine minutes*. We then took up the friends we had taken from Birmingham, with five in addition, and proceeded on to the market-place in Bromsgrove, and turned the machine and coach round without stopping, and returned back to the Crab Mill inn, having travelled about fifteen miles, where we arrived twenty-seven minutes before one o'clock. We halted there thirty-five minutes, and set off home. On descending the hill we thought proper to shew our friends, twenty-five in number riding, that the machine was manageable on the most hilly roads, by making a stand still on the steepest part of the hill. We proceeded on to the Rose and Crown inn at the foot of the hill, where we halted twenty-five minutes, elated that we had, by ascending and descending one of the worst hills in the kingdom, established the fact that our machine would travel on any road, however bad. We halted again at the Bell inn, at Northfield, eight minutes, and took three other friends up, and proceeded on to Birmingham, taking up *Worcester*-street, an ascent of one *yard in twelve*, thirty-two persons, and arrived at the manufactory at thirty-five minutes past four o'clock, having consumed eleven bushels of coke, value 2*s*. 6*d*., and travelled in all about twenty-nine miles.

I am, for self and Brothers,
Yours respectfully,
JOHN HEATON.

Birmingham, Sept. 3, 1833.

Description of the Engraving of Heaton's Steam-Drag.

a a are the hind wheels, on the spokes of which is fixed a ring of wood *b b*, on which ring is an iron-toothed wheel, as seen in the sketch, into which the wheels *c c* are cuppled by stays on the axletrees *d*, which are plain ones, as in a common coach. A shaft *e*, with a double crank, is set at 90° or right angles, and this shaft carries the two wheels *c c*, which are loose on the shaft, and are furnished inside with ratchet teeth, which are acted upon by catches fixed on the ends of the shaft, so as to allow either wheel to advance faster than the other in turning a corner or circle. *f* is another shaft, with a crank at right angles; *g g* are two iron rods, furnished at each end with brasses to fit the cranks on *e* and *f*, so as to connect them together, and transmit the motion given by the shaft *f* to the shaft *e*. On the shaft *f* are three wheels, which are put in motion by three similar wheels on the shaft *h*, which slide on the shaft, and are put in to gear as the nature of the road may require, to allow the engines to make more or fewer strokes for one revolution of the hind wheel *a*. The shaft *h* is also furnished with double cranks at right angles, which are in immediate connexion with the piston rods of the engines.

The engines of our present machine are seven inches diameter, and twelve inches stroke, and are placed upright at the situation of *g*, and are supplied with steam by the guidesman placing his foot in the clog *k*, and extending his foot or drawing it back to start or stop the engine, as occasion may require. The apparatus for steering the machine is seen in front; *m* is a wheel fixed on the top of a shaft, that extends down the post; *n*, at the bottom of which is a block, on which a chain is fastened, that extends near to each fore wheel, for the purpose of bringing either wheel forward, by means of a toothed

pinion working into the wheel *m*, and is furnished with two handles.

The boiler and fireplace are very similar to those of the engines working on the Liverpool and Manchester Railway. *o* is a wheel fixed on the shaft *e*, and is encircled by an iron spring-hoop, and connected with a lever in front of the engine, for the person steering to tread in case of descending a hill, acting in the same way as a brake to a windmill. The whole of the machine is mounted on springs, and disarrangement is prevented by the rods that connect the shafts *e* and *f* together. *p* is a wood-trussed frame, bound together by iron screw pins, to which all the other work is fixed. The carriage, of whatever description it may be, is connected by a short perch pole at the situation of *q*.

MACERONE AND SQUIRE'S STEAM-CARRIAGE TRIP TO WINDSOR.

"*Dick Dubious.*—The clinkers which Mr. Rattler affects to treat so lightly, constitute, if I am rightly informed, one of the greatest practical difficulties which steam-carriage speculators have to contend against.

"*Editor.*—It is certain they do."

Peterborough Court Conversazione.

On Saturday last the steam-carriage constructed by Colonel Macerone and Mr. Squire, started from the wharf, No. 19, at Paddington, with the view of running to Windsor and back. The carriage, with fifteen persons, &c. might weigh about three tons and a half. It stopped at Turnham Green to take in water, which took up six minutes. It again stopped about six miles further on for the same purpose, and was delayed seven minutes. On reaching Middlebridge, about a mile on the London side of Colnbrook, the road, precisely on the rise of the bridge, had recently been covered four inches deep with loose stones, and *the steam not being at that moment very strong, owing to a little negligence on the part of the stoker*, the carriage stopped. The steam was, in fact, not sufficiently powerful to make the carriage overcome the obstacle, and it was not without the assistance of the gentlemen in it that it was got over the bridge. Every other hill in its progress it ascended without difficulty. The delay here was 17 minutes. Again, before reaching Windsor, the carriage was stopped to take in more water, and *get the fire in good order*, which caused a considerable delay. There were one or two other trifling stoppages, but, including them all, the carriage reached the New Inn at Windsor in 2 hours and 56 minutes. Including stoppages, it went at the rate of nearly 8 miles an hour; excluding the stoppages, at the rate of 12. The speed was at the rate of 10, 12, 13, 11, and at one time 14 miles per hour. After remaining at Windsor for 1 hour and 46 minutes the carriage again started for London, and in grand style. It was soon found that proper precautions had not been used at Windsor *to keep up the fire, and clear out the fire-place*, and before reaching the first halting place *the fire got low*, and the steam diminished much in power. Nevertheless, the carriage ran on at the rate of 7, 8, and 9 miles per hour, and notwithstanding sundry stoppages to take in water, as well as on account of little accidents, chiefly owing to a want of care on the part of the workmen, it reached Hammersmith about half-past six, when the hind axletree broke, and its further progress was suddenly arrested. Even this, however, caused no concussion, and the passengers alighted without the least hurry or injury. Except when the carriage was at rest, and when the machinery was worked *to get up the fire*, which occasioned a jarring, there was no unpleasant motion, noise, or heat whatever. There was no smoke, because the fuel was coke. There was no escape of steam, and the noise did not exceed that made by a common cart when rapidly driven. The carriage with which this trip was made consisted of an open chariot, placed before a steam boiler. The merit of the invention consists, we understand, in the boiler. The engine, of course, is of the high-pressure kind, and has generally been worked at the pressure of 150lbs. to the square inch; but on the trip to Windsor the pressure was not equal to that. The whole of the machinery, except the boiler and fire-place, which are behind the chariot, is placed horizontally beneath the carriage, and between a strong frame of wood work. The size of the whole is not greater than that of an omnibus.—*Abridged from the Observer.*

THE UNDULATING RAILWAY.—MR. BADNALL'S FURTHER REPLY TO HIS OPPONENTS.

Sir,—Your Number of the 31st August, with several others, containing articles on the subject of the undulating railway to which I have not yet replied, are now before me, and I shall feel indebted by your early insertion of this general answer to them.

I regret to find that the expression of my incompetency to understand the formula of "S. Y." has had the effect of exciting his indignation, and the more

so as I am compelled to make a similar declaration in allusion to his communication of the 20th June, (page 242.)

According to "S. Y.'s" reasoning (and I cannot, I think, misunderstand *this* part of it,) the same *expenditure of power* is required to move a body, or to overcome friction, for a given distance, on an inclined plane, as on a horizontal line. His conclusion, although still inexplicable to me, is thus expressed—"*The entire expenditure of power to move the wheel the horizontal distance* b *on the level rail will be* b n *pounds, and upon the inclined plane it will be*" (he does not say *up* or *down*) $\frac{b}{L} n \times L = b\ n$ *pounds as before;*" which equality of the force of traction he states to exist at all heights and elevations of a given inclined plane. Now there are, I should imagine, few of your readers who are not aware that if a body be drawn *up* an inclined plane, the power which is necessary to raise it is *as the inclination of the plane;* and when the power is also parallel to a plane, the length of the plane is to the weight to be raised as the height of the plane is to the power.

And there are still fewer, I am convinced, who do not comprehend, that while a body would remain stationary on a horizontal plane, it would roll *down* an inclined plane, without any extraneous assistance, and with a velocity proportionate to the degree of inclination. How, then, either in one case or the other, can the force of traction on a horizontal line be equal to the force of traction on an inclined plane, whose base is of equal length? And yet "S. Y." blames me because I cannot understand his formulæ, the one where (page 181) he states, "the power expended on moving the wheel from A to E upon the horizontal line $= 16\,n$ pounds, and upon the inclined plane $= 20 \times .8\,n$ pounds $= 16\ n$ pounds, *as before.*" And again, in page 242, where he corroborates this erroneous conclusion by the equally erroneous formulæ above stated. I beg to remark, that, in the view I have taken of these formulæ, I have done every thing in my power to induce myself to believe that there are some gross errors of the press; but as I cannot (the same results having been twice published) believe the printer *guilty, and* as I cannot possibly understand "S. Y.'s" symbolical explanation of the laws of friction, as affecting the present question, I must again risk his displeasure by confessing myself in the dark, and by entreating some of your scientific correspondents to remove the cloud. I beg to add that .8 being substituted for 8 *by no means* unravels the mystery.

"S. Y." further remarks, that "the quantity of power required by the friction is the same for the same horizontal distance moved, whether the motion is on the curve or the horizontal rail, *provided the velocity is the same in both cases.*"

Now the *difference* in velocity is one of the fundamental features in my position, and there is no doubt but that this very difference in velocity is an auxiliary cause of reduction of friction. If, therefore, "S. Y." argues under a supposition that the velocity is *alike* in both cases—even if his formulæ were correct—his consequent reasoning must be founded in error.

Again, "S. Y." remarks, that the piston of a locomotive engine must necessarily make more strokes per minute *on a curve* than *on a horizontal line*, in order to move the wheel over an equal space *in the same time.* Now, if he mean *effective* strokes, he is wrong—if strokes in accordance with the revolutions of the wheels, he is perfectly correct. On this difference *very much depends.* If a more effective power of steam be required upon a curve than upon a horizontal line of proportionate length, to attain an equal velocity, I at once confess that there is no advantage in an undulating railway. But this is the very point in dispute. I maintain that *friction is saved*, and *that fewer effective strokes of a piston are requisite to traverse a given distance, or to convey a given load, upon a curve than upon a horizontal line of proportionate length, in equal times.*

Upon this affirmation my challenge is founded. Experiments, hitherto uncontroverted, establish it; and diagrams, which I believe to be indisputable, confirm the result of experiment.

"S. Y.'s" remarks, in page 377, display a soundness of judgment which *almost* induces me to forget his concluding paragraph—"I perceive Mr. Badnall does not intend again *replying to anonymous correspondents;* as far as I am concerned, I beg of that gentleman

to study nothing but his own convenience."

"S. Y." *must* know that the address which accompanied his name would exclude him from what I deemed the list of my anonymous opponents. If otherwise, I trust he will no longer be in doubt as to the reception, on my part, of any observations which he may do me the honour to offer on a subject which engrosses much of my attention.

I now turn to what I consider the sounder part of his arguments, page 377.

I fully agree with him in some points, especially when he affirms that where inertia is overcome by allowing the carriage to descend an inclined plane or curve, "*we must depend on our* locomotive engine for *maintaining* the velocity we have imparted," &c. This is unquestionably true, as far as it is possible for locomotive power to maintain a high velocity on a level; but will "S. Y.," or will any of your correspondents, state how it happens that if, at the foot of an inclined plane (say the Rainhill or Sutton inclined planes, on the Manchester and Liverpool railway,) we are travelling at the rate of thirty miles per hour, with a *full* load, we *cannot maintain* that velocity on the level? Is it the resistance of the atmosphere? If so, how then do we attain it on the inclined plane?

"S. Y." has also adopted another important argument as affecting this question. He remarks, "Mr. Badnall says the friction on the road decreases as the velocity increases; hence, though a constant power were at disposal, its effective employment would be diminished for want of fulcrum, when the velocity was very great." Hence, he continues, "*the curve would not obviate this difficulty, but rather increase it;* FOR THE VELOCITY MUST BE GREATEST ON THE CURVE," &c.

"S. Y." is perfectly correct: the velocity is the greatest on the curve; and it is, in my opinion, owing to the diminution of pressure (or fulcrum) at each point of contact that the momentum of a rolling body, after traversing a given curve, and influenced by a given power (see models), so nearly assimilates to the momentum of the same body, influenced by a similar power, after traversing a horizontal line of proportionate length, when, owing to reduced friction, a greater momentum would naturally be expected on the curve than on the level line.

"S. Y." says, my calculations are purely theoretical—that I suppose friction provided for by the moving powers, and trouble myself no further about it.

Now, what are we discussing? Is it not the theory? But "S. Y." urges my *practical* consideration of the subject, and thinks I "ought to have treated it a little more practically."

If he knew my anxiety to witness the practical results, and considered how much of my time is occupied in replying to theoretical objections, he would pardon my apparent lukewarmness (until opposed on such points) in discussing, though not doubting them in the slightest degree.

"S. Y." "does not deem it necessary to occupy your valuable space by answering every thing *an opponent* may advance."

Pray, Sir, did I oppose him, or did he oppose me?

We next turn to Mr. Ham's problem, upon which subject Mr. "S. Y." is polite enough to give me some seasonable advice. He thinks I ought to re-study my arithmetic: I will do so with pleasure when he embodies therein his new mode of ascertaining the comparative force of traction on an inclined plane, and on a level line.

Mr. Ham will, I am sure, perceive, on consideration, that the results of my calculations are, *in their proportions*, very nearly, if not quite correct. I confess to "S. Y." that when I first saw the problem, and when I calculated the results, I did not perceive * the limits of descent, viz., 16 feet 1 inch, 32 feet 2 inches, and 48 feet 3 inches, as denoted by Mr. Ham. But as those limits *can have nothing to do with the* PROPORTIONATE *times occupied in traversing the two lines*, I am not without a hope that when "S. Y." considers the subject more thoroughly, and has an opportunity of impartially comparing my calculations even with his own, I may still maintain the little credit of which he would apparently deprive me, of having in my younger days endeavoured to comprehend the common-place rules of arithmetic.

"S. Y." is also mistaken in saying that "I have *called upon public compa-*

* See page 179, where this oversight may perhaps appear excusable. Had it not occurred, why should I have required the data of one and two *yards?* See my letter, page 346.

ties to suspend their proceedings until I have convinced myself of my error." I have not done any such thing; and I can promise him, that if he be appointed engineer on any new line of railway, he may cut down hills, and level valleys; he may throw expensive bridges across canals, rivers, and roads; and, when completed, he may enjoy the prospect of a *perfectly level railway*, without exciting either my envy or jealousy; nay, he may congratulate himself and his supporters that hundreds of thousands of pounds have been expended in attaining—what? —AN UNIFORM MOTION! *Will posterity believe it?*

"S. Y.'s" last and shortest communication, is strictly to the point. He fully comprehends my meaning—friction *is* a *chief* point of consideration. The effect of atmosphere in producing uniform motion, to which he refers, will be alluded to in my answer to Mr. Cheverton.

If "W. W." were not an anonymous correspondent, he would not, I am sure, on reconsidering his remarks on *pressure*, wish me to reply to them, as many, thus opposed, might be inclined to do. He confesses that he has little knowledge of mechanics: his candour ensures my friendly disposition towards him. He is altogether mistaken. The greater the velocity of a rolling body, the less is the pressure of that body upon any and every point of surface on which it runs, whether up hill, down hill, or on a level; or, in other words, *the amount of force with which all bodies press upon the earth is in proportion to the velocity at which they travel along the earth's surface.*

"Junius Redivivus" (p. 316) remarks, "The sagacity of Mr. Cheverton has detected the *true source of the error*—the horizontal railway was not long enough for the carriage to attain its uniform motion, whilst on the undulating railway the inertia was overcome almost immediately!"

But "Junius" also says—

1st. "As the return stroke of a pendulum is less than that which precedes it, there must consequently be a loss of part of the original power which put it in motion, and corresponding to this must be the loss of momentum on the ascent of the curve."

2d. "*As the* arc of the curve must be *greater than* the chord of the arc, the difference in their relative length will be *another amount of loss.*"

3d. "Every successive fulcrum is available along the whole of the level line, and no power is wasted; whereas, upon the ascending curve, power is expended fruitlessly, owing to the fulcri being insecure, and *this is another amount of loss.*"

THEREFORE *(three other true sources of error!)* the level line is preferable to the curved line. Q. E. D.

Now, if the first position of "Junius" be right, the vis inertiæ, which was (as suggested by Mr. Cheverton) overcome at starting upon the curved road, *ought not* to be claimed as an unfair advantage; because, according to "Junius," the momentum gained in the descent ought to be expended in the *first ascent* WITH A LOSS, while on the horizontal line the velocity would be gradually increasing.

And so, in regard to the second position, as the arc is greater than the chord of the arc, the time, according to "Junius," ought to be proportionably less upon the latter than the former. *Here, then, there ought to be a further loss!*

And so, in regard to the third position—as the fulcri on the curve are more "insecure" than on the level, the spring, or motive power, ought *not* to have acted so effectually as on the level. *Here, then, should have been a still further loss!*

But how did it happen that the carriage arrived sooner at the end of the undulating than the level railway? It had *three sources* of difficulty (as pointed out by "Junius") to contend with *on every undulation*, whilst on the level it had a clear passage, and *secure fulcri* to work upon. How, too, did the same result occur when the carriage traversed six feet on a dead level (see London models) before measuring velocity on either railway?

It is rather extraordinary that "Junius" cannot avoid opposing Mr. Cheverton, even when he endeavours to support him.

There are some points, however, on which we agree:—

Gravity *produces* momentum down hill, and *opposes* it up.

The *greatest* pressure on the rail *does* take place at the lowest point of the undulation.

The wheels of a locomotive engine *are* occasionally found to slip when ascending an inclined plane.

A man *can* walk *down* hill with less labour than *up* hill.

A piece of iron *can* be moved with less difficulty (the poles agreeing) to a magnet than from it.

And what of all this? Are there any of your readers who doubt one single position, with the exception of the acknowledgment which "Junius" makes in reference to the pressure at the centre of the undulation?

But even in this respect "Junius" contradicts himself: he says, *the pressure is not greatest at this point unless the body be in motion*, for, he adds, "if you stop the carriage with blocks on the inclined plane, and then raise the plane to a vertical position, *the total amount of friction* ON *the rail would not be lessened.*"

Now, Sir, your friend "Junius," who in a general point of view is a most useful and instructive writer, must indeed have been driven to an extremity on this subject; first, to argue it at all, if he allows *that my proposition was true*, IF *the carriage were in motion;* and, secondly, to compare, in such an argument, the *pressure upon the blocks* and *upon the brackets* with the *pressure of a carriage standing on a horizontal rail.* "Junius" knows very well, or he ought to know it—and *if* he know it he ought, in justice to his usual candid disposition, to confess it—*that the pressure* UPON *the rail must inevitably be reduced in proportion to the angle of its inclination.*

One word more to "Junius," and, for the present, I leave him. He says, "polish the wheels and the rails, and put oil between, there will be no fulcrum remaining; and though the wheels may turn round, the carriage will not move." Now let him do this on both railways, and mark the result: on the level the carriage is stationary—but how is it on the curve?

"S. Y.," in his last communication, clearly sees that the nearer you approach to an abolition of friction, the more evident appears the advantages of a curved railway; for abolish friction altogether, and suppose the resistance of the atmosphere also removed, and what is the unquestionable result? An impulse being given to a body on a horizontal plane, it would move on with uniform velocity for ever; but a like impulse being given to a similar body, on an undulating plane, the velocity of each descent is an uniformly accelerated velocity. The velocity of ascent is equal to the velocity of descent; and the average velocity must be greater than the velocity on the level line, in proportion to the length and depth of the undulation.

In replying to Mr. "T. H—d," I beg to observe, that *I do wish* for his exposure of my false conclusions; and I not only *wish him*, but I beg him, as a personal favour, to set this question at rest by the publication of such mathematical evidence as will, in his own words, "*demonstrate that the resistance to the progress of a locomotive carriage will be greater on an undulating than on a straight railway, and the more so as the depth of the curve is increased.*" If he accomplish this, I will bow to him with the humility becoming a vanquished foe: it is *all that I have been asking for*—my challenge invites it; and I only regret that he should have waited for the renewed expression of my wishes on the subject.

I return the courtesy which Mr. "T. H." pays me, and cordially shake hands with him as brother labourers in the field of science.

I now turn to my more strenuous opponent, Mr. Cheverton, whom I am happy to find is considered by several of your correspondents in the light of a champion. I congratulate him upon the altered tone in which he has addressed me. In his first letter he gave me, what from a child I have detested, *a pat on the cheek.* "*I deserved his gentlest treatment.*" In his last he appears to assume the character of a stern, a positive, a magisterial, but, nevertheless, a most erroneous adviser.

Mr. Cheverton commences by waiving the subject of friction, which he leaves to my opponent "S. Y." That gentleman asserts that the whole question exclusively depends upon the comparative amount of friction on the two lines, and if so, I regret Mr. Cheverton should have omitted to grapple with this part of the subject.

Your readers will perceive that the main point in dispute between Mr. Cheverton and myself is, whether locomotive steam power is, like gravity, a constant force.

Mr. Cheverton says, "*it would be an idle assertion to say that* IT IS NOT." I maintain, that it would be not only an

idle, but a most erroneous assertion, to say that IT IS. Here, then, we are at issue. Steam power *is not* a constant force: it is *nothing like a constant force,* and (although, for the sake of argument, I admitted, in my last letter on this subject, the consideration of it, in theory, *as a constant force,)* I do not hesitate to say that *it never can,* in its applicability to locomotive engines, *become,* at great velocities, *a constant force.* Why? *Exclusive of the resistance of the atmosphere,* and exclusive of the time expended, wherein *no power can be exercised,* at every alternate stoppage of the piston, which loss may possibly be modified in future and more efficient engines, it is an unquestionable fact, that the greater the velocity the greater is the decrease of the effective power of the engine, and this decrease of power must necessarily be a natural result under any improved construction of locomotive engines.

There are two causes for this, equally true, equally invariable. The first is, that the *nearer* the velocity of the whole moving body assimilates to the velocity at which steam can advantageously expand, and be advantageously applied, or the *more* such first mentioned velocity exceeds such latter velocity, the greater is the sacrifice of power.

Secondly. The greater the velocity with which the engine moves over the earth's surface, the less is the pressure of that engine on the rails, and consequently the less is the resistance against which, as fulcri, the steam power can be effectively employed.

So true are these positions, that it is, I believe, generally acknowledged that when the piston is moving at the rate of 130 strokes per minute, which is the case at about 23½ miles per hour, nearly, if not quite, *one third of the entire power of the engine is uselessly expended.* And yet, if the steam be shut off, the attained velocity begins immediately to diminish. So it is with even *spring power,* as in my model carriage—the nearer the velocity of the moving engine assimilates to the velocity at which the spring would unwind when taken off the rails, the *less* is the effective power; so much so, that supposing the engine had, in descending an inclined plane, attained a velocity equal to the velocity with which it would unwind when taken off the rails, the power would be altogether useless.

Now it must be borne in mind that these considerations are altogether distinct and separate from any effect the atmosphere may be supposed to have in opposing or regulating velocity.

But let me ask, is the power of gravity influenced or diminished by such causes? There is not, I am sure, one individual, professionally connected with railways in this country, and who has paid any attention to these important subjects, who will dispute the two positions I have laid down in reference to the *inconstant* action and effect of locomotive steam power. And I do not believe, on the other hand, that I am risking any chance of controversy in maintaining that *the power of gravity,* acting upon a descending body, *never can at any velocity be diminished,* but on the contrary (however minute and unimportant its increase near the surface of the earth) that power *must be* continually increasing.

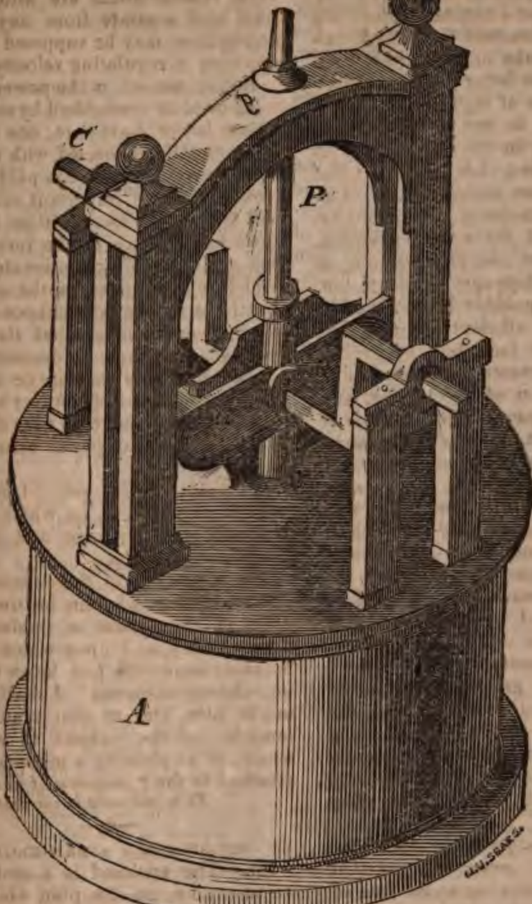
So much for this part of my dispute with Mr. Cheverton, on which subject I willingly leave my case and his to the judgment of others.

I now proceed to those points in his communication wherein he treats of the effect of atmosphere in producing uniform velocity, and upon which I am as much at issue with him as on the question already discussed. I shall also submit to him, and to your readers, a few remarks on the subject of *that force* which, in so pleasing a manner, he has attached to the "*category of nonentities.*"

(To be concluded in our next.)

DESIGN FOR A STEAM-ENGINE.

Sir,—The enclosed is a design for a steam-engine, on the plan which I proposed to you in a recent communication, (p. 362.) A is the cylinder, or case enclosing the cylinder. P is the piston rod. *g* the guide to the piston rod: this is supported by four columns from the top of the cylinder, and between the pairs of which the ends of the groove slide to keep it steady, and at right angles to the crank shaft. C is the crank shaft and axis of the fly wheel, supported by four small pillars, fixed upon the top of the cylinder. R the roller on the crank. G the groove; this has brackets above and below it, that its rectangular bearing with the halves of the piston rod may be preserved. For this purpose I would have the middle part of the bracket tubu-



lar, and turned true as a socket, to receive the ends of the separate halves of the piston rod, and each of these halves should have a flanch at several inches from the end, that it may be screwed down by a circular nut into the tubular part of the bracket; this is shown externally in the drawing.

The position of the piston, at the bottom of the cylinder, and the manner of the rotation of the crank, are explained in my former letter.

Your most obedient servant,

S. D.

London, Aug. 21.

THE "CASE IN TRIGONOMETRY."

Sir,—I am not in the habit of replying to any remarks that may be made on my lucubrations in your excellent Magazine; but for once I shall break through this rule. Your correspondent, "Tempora," (a very juvenile correspondent, I ween, notwithstanding his antique airs,) has made an endeavour to prove a certain

case in trigonometry to be "both possible and practicable," which I had humbly submitted to be neither one nor the other. But though, to all appearance, wondrously satisfied with his performance, it will not require many words to shew that it is one of which he has much greater reason to be ashamed. He fancies that A B and B C must be in the same straight line (see p. 407); but if he will take a few more lessons in trigonometry, so as to make himself master of similar rectilineal figures, and will then consult the solution given by E. J. Erichson, pupil at the Mansion-House, Hammersmith, he will find that he is prodigiously mistaken. Should he, however, prefer to be convicted by his own diagram, let him draw from the point B a straight line, B F, perpendicular to A E, and assuming the angle A B F any thing he pleases—say 7° $30'$—then let him calculate A D.

Now, Mr. Editor, a few words to yourself. I hereby give you due notice, that I shall attend your next *Conversazione* at Peterborough-court; and if you cannot account satisfactorily for allowing Mr. Tempora (*Oh, Tempora!*) to talk such nonsense in your scientific magazine, I will make a motion, that you shall be fined a Scotch gallon of double-strong Glenlivet, for the benefit of all concerned.

Yours, &c.

IVER MACIVER.

[We shall be glad to see our friend Iver at our next *Conversazione*, and shall reserve our vindication till then.—ED. M. M.]

MR. RUTTER'S NEW PROCESS FOR GENERATING HEAT.

We have now the pleasure of laying before our readers the first detailed and authentic account which has yet appeared of the new mode of generating heat, discovered and patented by our esteemed friend Mr. Rutter, and which, to use the words of a correspondent, quoted in our last Number, seems destined "to change the face of the world." The heat obtained is, we understand, extremely intense, very uniform, and, what we scarcely expected to find would be the case, *perfectly manageable*. The process has been in successful use at the Salisbury Gas Works ever since the patent was taken out, and it has also been tried on board of a steam vessel, off Lymington, with equally gratifying results. The following details of the process we extract from a copy of Mr. Rutter's Scotch specification, with which he has obligingly favoured us; his English and Irish specifications have yet to be enrolled:—

"My invention of an improved process for generating heat, applicable to the heating of boilers and retorts, and to other purposes for which heat is required, consists in the employment of bituminous, oleaginous, resinous, waxy, or fatty substances, in a liquid state, and in conjunction with water as fuel, in manner hereinafter described. I carry my said improved process into effect in manner following, that is to say, by allowing or causing one or more of the said bituminous, oleaginous, resinous, waxy, or fatty substances, as coal tar, for instance, to flow from a cistern or other vessel suitably placed, through a pipe or other convenient channel, into a spout or funnel communicating with the interior of an enclosed fire-place or furnace, and at the same time allowing or causing water to flow from a cistern or vessel, placed in a suitable or convenient situation, through another pipe, or other convenient channel, into the before-mentioned spout or funnel, in which spout or funnel they are allowed or caused to flow or drop simultaneously upon a fire previously kindled and burning within the before-mentioned enclosed fire-place or furnace, subject to the regulations hereinafter mentioned or described. It is not essential that the coal tar, or other of the before-mentioned substances, should first come into contact with the water in the spout which communicates with the interior of the enclosed fire-place or furnace. Indeed, I rather prefer that they should first come in contact with each other in a funnel at some little distance from the furnace, and from thence be allowed to flow together, through a convenient channel, to the spout by which they are admitted into the interior of the fire-place or furnace; but the tar or other substance, and the water, should be in contact prior to or at their entrance into the fire-place or furnace, and being so in contact should fall simultaneously upon the fire so burning within the fire-place or furnace; and if the fire-place or furnace be large, two or more of the spouts or channels for introducing the coal tar or other substance and water together, may be adapted to such fire-place or furnace in such manner and at such distances from each other as may be found most convenient. The stream of coal tar, or other of the before-mentioned substances, and of water respectively, is or may be regulated by means of stopcocks or valves, either in or attached to the cistern or other vessel, or in any of the pipes or channels before mentioned. The spout or other channel through which the coal tar,

or other of the before-mentioned substances, and the water, are introduced into the interior of the enclosed fire-place or furnace, should be left open, so that a supply of atmospheric air may thereby be admitted to the said enclosed fire-place or furnace, care being taken that too large a supply of atmospheric air be not admitted. Although I prefer the heating, inflaming, and decomposing surface of a fire, burning within an enclosed fire-place or furnace, as aforesaid, in carrying my said improved process into effect, as most favourable to the complete and effectual combustion of the coal tar, or other of the before-mentioned substances, in conjunction with water as aforesaid, yet the same is not absolutely essential to the said process, for, the combustion of the coal tar or other of the before-mentioned substances, in conjunction with water, may be effected in a furnace, oven, or other close vessel, previously heated, and afterwards kept at a proper degree of heat, either by heat disengaged within the said furnace, oven, or close vessel, or by heat being applied externally, or in any other way that shall be found most convenient. It is not essential that the water employed in my said improved process should be fresh or pure water, for sea water and impure water, such as the bilge water in ships, and the ammoniacal liquor in gas works, will answer the purpose. The respective quantities and properties of coal tar, or other of the before-mentioned substances, and of water, proper to be admitted or introduced into the enclosed fire-place or furnace, oven, or other close vessel, will be found to vary according to circumstances and the materials used. The proportions of coal tar and water which I have found productive of a good result, are one gallon of coal tar, to be used simultaneously with one gallon and a half of water, and these qualities should be so regulated as not to fall upon the fire or other heated surface, as before mentioned, in much less than from two to three hours; but the proper proportions to be used may be ascertained by observing the interior appearance of the said enclosed fire-place or furnace, oven, or other close vessel (which may be done at or through one or more of the spouts or other convenient channels provided for the introduction of the coal tar or other material and the water, or at or through one or more convenient apertures made for the purpose); for if water be in excess the flame will be weakened or extinguished; or if tar, or other of the before-mentioned substances, be in excess, then the flame will be obscured by smoke."

Mr. Rutter does not lay any claim to the apparatus or machinery employed in the process, but limits his patent right to "the mode or process of generating heat, by subjecting bituminous, oleaginous, resinous, waxy, and fatty substances, or a mixture of two or more such substances, in a liquid state, in conjunction with water, to ignition, combustion, and decomposition, in the manner before described."

WOOD CARVING.

Sir,—I should feel particularly obliged to any of your intelligent correspondents that would put me in possession of a good chemical agent for removing paint and dirt from the surface of ancient oak carvings. A strong solution of potash is generally used for this purpose, applied with a stiff brush. But the wood being very old and dry absorbs so much of the liquid that it is apt to swell and split, and invariably leaves the surface of the work very rough and uneven. These are matters of some importance when the carvings are minute and delicate. If the alkali could be applied in some unctuous matter, so that it could act upon the surface without penetrating so deep into the pores, and at the same time could be removed without using much water, it would, I think, be a very useful piece of information.

Wood carvers are frequently required to restore the mutilated parts of ancient specimens, and they are expected not only to match the original in workmanship, but also in colour. The material generally used for dying the new parts is pulverised lime, but this invariably leaves a red tint, easily detected. The plan I adopt is to have the new parts grained in water colours, to match the original, and if this be neatly done the most acute judge cannot detect it when the work is nicely varnished. But some specimens that we have to repair have such an exquisite and delicate emboss that they are never varnished, but left just as they came from the hand of the artist. In all cases of this kind I have found the muriate of soda answers best to bring the new parts to the same tone and colour as the original.

Such is the rage for ancient wood carvings at this time in England that scarcely a week passes without large quantities of it being imported to this country. This influx of good specimens from the Continent has already had the effect of making English wood carvers busy, and we feel encouraged to hope that it will

be the means of introducing a good taste among the patrons and encouragers of art, which may lead to the popular adoption of the rich and beautiful style of Louis XIV. The introduction of the style called severe Greek into the decorations of interiors and pieces of furniture, from its plainness and simplicity, has left the talents of the wood carver in a state of unprofitable inactivity. But should the style of Louis XIV. be resuscitated, wood carvers will have an opportunity of showing the world that they possess talents of no ordinary quality, in spite of all that has been so ignorantly asserted to the contrary, by persons who ought to have known better. It has hitherto been our misfortune to be employed by persons actuated by no higher motives than that of "buying cheap and selling dear;" the consequence is that the most vulgar competition has been ingeniously kept up—injurious both to the artist and the art. When the decoration of a royal palace, or a nobleman's mansion, has presented an opportunity for display in our profession, we have always been met on the very threshold of the building by the architect, who, in-instead of encouraging the legitimate artist, delights, from ignorance or some other cause, to decorate in a wretched substitute called "composition," to which neither interest nor value is attached. Modern architects, with very few exceptions, are the most boisterous and overbearing individuals, to those over whom they can exert any influence, that it is possible to conceive. Being often themselves as ignorant as proud, they are ever anxious, by a rude confidence and a foolish adoration of things merely because they are old, to make the world believe they possess that sterling talent which gives dignity and importance to those who have acquired it. However erroneous the modern architect's ideas may be on any particular branch of art, he will never submit to be set right by the suggestions or the experience of the practical man. To deviate from an architect's drawing in the most trifling detail would be high treason. And, oh, those drawings! what a collection of hard wiry lines, copiously interlarded with sections and profiles, to make "discrimination indiscriminate!" Yet it is *principally* through such men as these *that talent is* suffered to rust for want of use, and the beautiful art of wood carving is supposed to be lost.

I was perfectly astonished not long since by an architect, who stands high in his profession, bringing me a rude piece of Elizabethan carving to restore, at the same time assuring me that he did not expect that I could match the old work, since carving had so much degenerated in this country: yet any person of taste would have supposed that this precious specimen of art had been carved with bits of flint and fishes' bone, by some wild Indians in a state of nature. It is quite a common thing now for polite authors to go out of their way to inform their readers that the art of wood carving has died a natural death in England. Dr. Paris, in his life of Sir Humphrey Davy, gives us the precise time when the genius of wood carving winged her flight from our shores: he says, "the father of Davy was *the last of the carvers*, an art which declined with Gibbons, and may now be considered as nearly lost." Where the Doctor picked up this rare and important fact I am perfectly at a loss to know, for I could never hear of the name or works of Davy as a carver, although I have made many inquiries. Yet nine persons out of every ten who read the Doctor's book will take this passage for granted, believing that Dr. Paris would never publish any thing calculated to injure an important branch of the arts, without first taking great pains to ascertain that it was quite true. I beg to inform the Doctor, that some of the first sculptors of the present day were originally wood carvers. Chantry was bred a sculptor of wood; and William Nicholl, whose colossal works so frequently attract attention in the model department of the Royal Academy, worked in London for some years as a wood carver. The fact is, instead of the art being lost in England—British wood carvers are the best in Europe, and the reason of this can easily be made obvious. Paris contained the best carvers that could be got from all parts of the Continent, at the time the first French Revolution broke out. This event paralysed the arts. The French carvers found an asylum in England—they taught and instructed English youth in all the excellence of their art. By emigration they did for the English precisely the same good office that the English are now doing for the Ameri-

cans, that is, made them as good carvers as themselves. It may be interesting to your readers, Mr. Editor, to know, that within the last four or five years many capital English wood carvers have emigrated to the United States of America; and we argue that they must be doing well, from the fact that not one of them has returned, although we know that many of them could do so if they pleased.

Whoever has attentively examined the nature and resourses of the New World, cannot fail to discover, I think, that her liberal institutions will soon present a congenial soil for the cultivation of genius and taste. The liberal arts are the noble fruits of liberty; they can never flourish in true grandeur where an intellectual popular feeling is not the grand source of their cultivation. Wherever liberty has dawned, there the arts have flourished. How did they bud and blossom in the republics of Greece and Italy! How did they decline and fade with public spirit and patriotic feeling at the approach of degrading thraldom! In England the noble and the wealthy boast that they are the patrons of the arts, yet under their auspices how painfully slow has been their progress onwards! Look at the yearly productions of our artists: can you discover any of that creative spirit which bespeaks originality and thought? —No! Are their forms, either in painting or sculpture, invested with the sublimity of ideal grandeur?—No! The fact is, the arts in this country are treated as matters of business rather than sentiment. The rich encourage them as a luxury for their own selfish enjoyment, instead of regarding them as a great moral cause in a country capable of producing extensive and happy effects when properly directed. If the influential part of the community had been sincere in their boasted wish to see the lower orders educated, how many opportunities have they had to extinguish our doubts on the subject? How many vexatious hindrances could they remove in the few free exhibitions that exist in this country? The inquiring mechanic may wander through a variety of rooms in the British Museum, stored with all that is rare and interesting, yet leave the building disappointed, bewildered, and dissatisfied, through not being able to learn the nature and qualities of the objects that have attracted his attention. If he were to give half-a-crown for a synopsis (which few of the class can afford), he would only possess a long catalogue of technicals, which to him would be perfectly useless. Could there not be brief descriptive labels attached to the most important specimens in the collection? In the sculpture gallery, for instance, I should like to see a short description of the subject, with the name of the artist, and the era in which he flourished, hung upon each specimen of art in the collection. But what I complain of as a gross injustice to the public, on the part of the managers of the British Museum, is, that the splendid collection of gold, silver, and bronze medals should be kept in private apartments, accessible only to the favoured few. What a noble exhibition would those medals form of themselves, if they were all neatly arranged in glass cases! The durability of this department of art gives it an interest peculiar to itself, and what good reason can be given for not placing these specimens in the public rooms I cannot conceive. That there is a growing desire among the industrious classes of the metropolis to see such things was fully exemplified in the petitions that were sent to Parliament last session on the subject. Those petitions I consider to be great signs of the times. The mechanics of London have begun, though late, to shew an activity and energy of character that will reform the British Museum, and make it what it ought to be,—an open national exhibition. And I hope that the wealth producers of London will think some of the hints I have thrown out respecting the Museum worth embodying in one of the sensible petitions they intend to send to the Legislature, when it shall again resume its law-making avocations. The working men are beginning to emerge from a long night of ignorance to a bright era of moral, intellectual, and political knowledge. The rich have patronised the arts, but they have made but few artists, if any. The producing millions will be the next patrons of art, and then artists will spring up, who, instead of being content with copying antique models, will take nature for their study, and rival rather than resemble the masters of bygone times. R. P.

Sept. 2.

THE ART OF SWIMMING.

Sir,—The inventor of the "Swimming Shoes"—G. W., seems so particularly well convinced that the MS. Treatise I quoted to his discomfiture in my former letter must be my own production, that I suppose I may as well spare myself the trouble of assuring him of the fact, that "Aquarius" and the writer of that Treatise are, *bona fide*, two separate and distinct persons. This latter discovery of G. W.'s, indeed, is about as well-founded as his former one,—on his defence of which, and attack of the inclined-plane theory, I beg to say a few words.

He observes, "it is notorious that the greatest progress is observed to follow the direct stroke outwards," and not "the bringing together of the legs from the point of greatest separation." I do not admit this to be the fact: the two motions follow each other so instantaneously, that it is not easy to pronounce, merely from ocular observation, which it is that is the effective one, although the balance, even then, inclines towards the latter. But there is an easy way of determining the matter. Let G. W., the next time he finds himself in the water (for it appears he *can* swim), take the trouble to strike his legs *outwards*, as forcibly as he pleases, *and forbear to draw them together again*, and see what will be the consequence. He will find his progress to resemble pretty closely that of the 'good swimmers,' the tardiness and difficulty of whose progress was so pathetically bewailed in his original communication.

He happens to be quite in the wrong when he asserts that, according to the theory advanced, "the effect ought to follow whether the legs were struck out vigorously or not, so long as they were by any means placed wide apart, and by any power forced towards each other." The legs must be drawn together with vigour from the point of utmost extension, and to do this it is absolutely necessary to strike outwards forcibly. The outward stroke, and the beginning part of the return, as already observed, so closely follow each other, that they form almost a continuous motion, and the one cannot be vigorously performed unless the other is also: so that it is a point of the first consequence that the outward stroke should be as forcible as possible.

If, indeed, it were practicable to give a strong inner stroke, without its being preceded by a strong outer one, it would soon be perceived that it is the former which is the effective propeller, and not the latter: but this, as will instantly occur to every swimmer, cannot be done. If G. W., nevertheless, will condescend, before he writes his next series of dogmas, to go into the water, and laying hold of some support at the side with his hands, stretch out his legs as gently as may be, and then force them towards each other with all his strength, he will find his body urged forward with considerable power—a power which surely cannot, in that case, even *apparently* be gained by an outward stroke, since no outward stroke is taken. This experiment, with that recommended just now, and *on actual trial of the swimming-shoes themselves*, will be quite enough to open G. W.'s eyes to the *merits* of his theory, unless his boasted ardour in the pursuit of truth should be cooler than his affection for the bantling of his brain.

G. W.'s next objection, so far as it can be understood, is easily disposed of. The force which a man can exert in drawing the extended legs together, is, I opine, not exactly "amongst the weakest of which he is capable," but, on the contrary, one of considerable strength.

In reply to the next objection, that "the illustration of the inclined planes is not applicable, unless the legs be kept extended until the feet are brought together," I had perhaps better quote another passage from the Treatise of whose authorship I have been so decidedly found guilty. It follows that already given in my first letter:—

"It is not by any means meant to be here asserted that a swimmer cannot make more way in the water than his own length, or the height of the inclined plane: certainly not;—because the power acquired by the legs is obtained by a stroke of probably not more than six inches in length when the legs are extended to their utmost width; that is, the compression of the sides of the feet in the two inclined planes, for a space of perhaps not more than 6 inches, confers all the moving power upon the legs that they at any time possess; but the power thus acquired is sufficient to drive the body through the water, in some cases, for several yards: the whole remainder of the movement of the legs is merely to effect the returning

of the feet to the proper position for acquiring fresh power."

From this G. W. will, if he studies the matter intensely, be perhaps able to perceive that the condition he has laid down is any thing but essential to the inclined plane theory; and, by narrowly watching the next good swimmer he may see (if he can catch one), he will also, perhaps, discover that he does not, as he imagines, "perform the operation of contracting the legs and bringing the feet together at the same time," but that the legs are kept fully extended, at least for 6 inches of the return stroke. As to assertions of this and that method being those "pointed out by nature," they may safely be allowed to pass for what they are worth. The same remark may apply to the observations as to the swimming of savage nations, although it is certainly any thing but a well-known fact, that the method they so successfully practice is "the paddling one deprecated by Aquarius"—and, by the bye, just as much deprecated by G. W. himself.

The diagram given tells at any rate quite *as much* in favour of the inclined plane theory as of that *now* broached by G. W., as far as it can be said to tell at all, for its meaning is exceedingly obscure. G. W., it seems, is himself not a bad swimmer. I am glad to hear that he professes any practical acquaintance with the 'noble art,' for now he will perhaps gratify the aquatic public, and immortalise his name, by reducing his ideas to practice, fitting on a pair of 'swimming shoes,' and letting us know how many yards in a stroke they enable him to progress. I am much mistaken if he do not find them much more like a "clog" than an auxiliary. As to the five-yards-a-stroke feat, in regard to which he is so incredulous, I beg to assure him, that it was not performed when "the tide had turned," and the swimmer "had his face towards the sea":—it was not performed in the sea at all, but in still fresh water, without any artificial or other assistance. I have reason to believe that Dr. Bedale's feat of the same description was tainted by a little quackery. I was well aware of the Doctor's visit to London last year, although I knew nothing of his swimming to Gravesend, a performance which the worthy Doctor, I should have thought, would hardly have allowed to pass without a trumpeting quite as loud as that which attended his swimming from Liverpool to Runcorn, *i. e.*, about half as far. There is, I believe, an Italian, who professes to swim an amazing distance, but then that is on a new system of his own, in which the practitioner progresses in a position perfectly perpendicular.

I remain, Sir,

Your's sincerely,

AQUARIUS.

THE METROPOLITAN IMPROVEMENTS.

Sir,—As my suggestion for a new street from Oxford-street, in a continued right line to the end of Southampton-street in Holborn, has met with repeated approbation by the readers of the Mech. Mag., I would venture to point out two other improvements, which, if carried into effect, would I think be of almost as great importance.

Every one who has travelled in an omnibus along Piccadilly towards the City, may have perceived that there is at present a very abrupt turn out of Coventry-street into Princes-street, which, besides not being in the direct line, is so narrow towards the bottom that two carriages cannot pass each other. Now, on referring to a map of this part of London, it will be perceived, that if Coventry-street was continued into Leicester-square, an almost direct line from the south-east corner of the latter would be obtained to King William-street, leading to the Strand, Waterloo Bridge, City, &c.

Such an opening from Coventry-street to Leicester-square being made, (and I perceive there are now three houses, with premises, extending from Leicester-square to Princes-street, in the line unoccupied, which, if removed, the frontage obtained would be of more than equivalent value,) another short street might then be opened from the north-east corner of the square to the end of Long Acre, and this, with Great Queen-street, form a good line to Lincoln's Inn-square, from which, at Great Turnstile, a short turn would lead into Holborn, and onwards to the General Post Office, City, &c.

Talking with a friend on these two lines, he suggested that another from Charing Cross, up St. Martin's-lane to Tottenham-court-road, was also much

wanted; but if the new street from Waterloo Bridge to Gower-street be executed (and it appears by one of your correspondents that it is at last to be begun), perhaps it would be better to continue St. Martin's-lane through Seven Dials to Broad-street, Bloomsbury, to meet the Gower-street line. With the hope that these suggestions may lead to improvements,

I am, Sir,

Your obedient servant,

JOSEPH JOPLING.

Razors superseded.—A discovery has been made that will enable us to laugh at blunt razors, as well as at those who make, grind, or wield them. Some months ago, a dog, rambling about the gas works of Johnstone, got by chance on its back a little of the Irish lime through which the gas passes in process of purifying. Mr. Blair, the manager, took a small bit of wood to scrape it off, when, behold, hair and all came away! "O, ho!" said Mr. Blair, "if this stuff takes the hair from a dog's back so neatly, why not off my chin also?" Before venturing it on his chin, however, he tried a little on his arm; to his delight it answered the purpose admirably, and never since has he bothered himself with a steel razor. When about to shave he covers the lower part of his face with the lime, in the consistence of thick cream, allows it to remain on three or four minutes, scrapes it off with a paper-cutter, or a piece of smooth-edged thin wood, and he has a chin as smooth as if he had just left the hands of an expert barber! What will operate as a temporary bar to the introducing of this new mode of shaving is the offensive smell of gas which the lime gives out. But means will be found not only to purify it from all offensive smell, but to scent it with the otto of roses to boot. It is more than probable, however, that the lime possesses the property under consideration, altogether independent of the gas.—*Paisley Advertiser.*

Periodical Literature.—The Congress of the United Mexican States have appropriated 30,000 dollars for the purchase of periodical publications, almost all of which are, of course, to be imported from foreign countries. The bill, as passed by the House of Representatives, appropriated 25,000 dollars: but on being increased by the Senate, was adopted with their amendment. Our countrymen will believe that the Mexicans are in earnest in the pursuit of national happiness, by the only means, viz., the improvement of the people, when they see the Government adopting measures that reflect so much honour upon their judgment and their feelings.—*American Paper.*

Force of Character under adverse Circumstances.—"The witness, Matthew Gemmel, (teacher of an evening school attached to the cotton spinning works of Messrs. Fulton and Co., Lochwinnoch,) is an example of what is occasionally done by some of the more enlightened and laborious of the operatives in overcoming the obstacles placed in the way of all by the present length of manual labour. He was bred a spinner here, and it may be remarked, that for twenty years he never was absent one day. He had no other advantages when young but what are common to all in the evening school of the work, of which he is now the teacher; and he has contrived to acquire a knowledge, in addition to the usual attainments necessary in such a teacher, of Latin, and the elements of Mathematics. Two spinners, John Monro and William Campbell, attended some courses in the University of Edinburgh last winter, from which they are returned, and at their work as usual."—*Factory Report.—Mr. Macintosh of the Northern District.*

Stupendous Hand Machines.—The introduction of power factories in the bobbin-net trade can scarcely be considered as yet complete; but at present the hand worker competes successfully with the power machine. The article he produces is confessedly not inferior, and the chief advantage enjoyed by the owner of the power machine is, that he works it with no labour but that of superintendence. Juvenile labour is not yet extensively introduced, as the complexity of the machinery is such that even a boy of fourteen or fifteen cannot in general be entrusted with the management of it, unless overlooked by a more experienced workman. The labour of working the hand machines must be very severe, and as fresh experiments seem to be constantly making on the degree of toil which the human frame is capable of sustaining, some of the recently constructed machines are such as none but the most athletic can manage. In 1829 the widest machine known was a twelve quarter, that is, capable of making a piece of net three yards wide. Since that time they have progressively enlarged, and I saw one man at work on a stupendous hand machine, twenty quarters or five yards wide. When it is remembered that, independently of the enormous toil of working this frame, in which both hands and feet are actively employed, the workman, who sits in the middle of the frame, has to watch every thread in a course of net extending on each side of him to the distance of seven feet and a half, some idea of the degree of proficiency may be formed, which is attained to. As yet there are only two machines of this width in the trade, and the opinion seems to be that they have now attained their maximum.—*Mr. Drinkwater.—Factory Report.*

Polishing Powder.—"Certain of the French manufacturers of polishing powder use in their manufacture scraps of old iron, which they put into a tub, and cause to rust quickly by sprinkling with water. When a sufficient quantity of rust has thus been formed it is collected by washing, and after allowing it to settle it is dried and calcined in a crucible. The longer the calcination is continued, the more the oxide approaches to a violet hue, and *the harder its grain.* At a very high temperature the oxide is partly reduced, its colour becomes more gray, and the grain too hard for polishing. The red oxide serves for polishing gold and silver, the violet oxide is fit for polishing steel. When taken out of the crucible, it is first triturated, and then levigated, in order to collect the finest parts."—*Journal des Connaissances Nouvelles.*

INTERIM NOTICES.

Mr. Jopling's rejoinder to "R." in our next.

Communications received from Mr. Sanderson—W. H.—Scrutator—Mentor—Mr. Waldron—T. W.—Violino—C.

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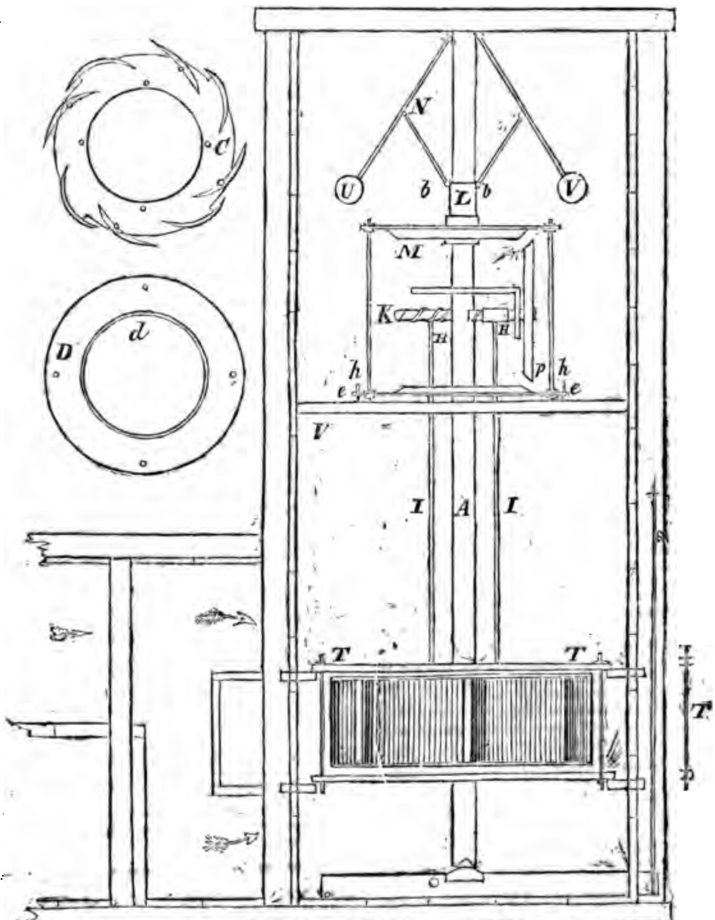
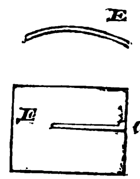
EASTMAN'S REACTING WATER WHEEL.



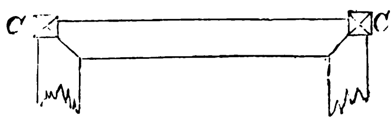
EASTMAN'S REACTING WATER WHEEL.

A patent has been recently taken out in the United States, by Mr. Robert Eastman, of Concord, New Hampshire, for some "improvements in the construction of the reacting water wheel, used for the driving of machinery by the reaction of water, by which improvements its action is rendered more perfect, and it is rendered self-regulating by the addition of a regulator or governor." The following specification of these improvements we extract from the *Franklin Journal*:—

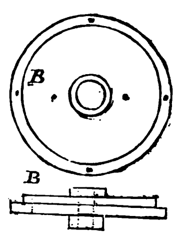
"The wheel may be made in whole or in part of cast iron, or other materials may be employed in its construction. It may be cast in pieces like those represented in the drawings, or the form may be variously modified, whilst the same principles are retained. Its dimensions may also be changed, and when of a very small size, the number of floats may be reduced to fewer than eight, which is the number I generally employ, as shown in the drawings. A is the shaft of the wheel, terminating below at the step on the bridge-tree O, which is capable of being raised or lowered by means of a suitable rod, or rods, as shown at S. When eight floats are used, four of them are stationary, and four are movable, and it is by means of the latter that the quantity of water to be expended is regulated. D represents the top rim of the wheel, which has a projecting fillet, *d*, cast on it, which is made to fit exactly in the opening of the cistern piece or plate C. A similar rim is made for the under side of the wheel, but on this I usually place the fillet on the outer edge. These rims are to be attached to the stationary floats by means of screws or rivets. On the flooring piece C, the stationary floats, which may be cast in one piece with it, are easily distinguished from the moveable floats, alternating with the former, and by their motion enlarging or diminishing the aperture at each of their ends. They are supported by bolts passing through them edgewise, and through the upper and lower rims. The plate F, having upon it the jointed arms, or connecting rods *a*, *a*, *a*, *a*, is intended to act on the moveable floats, in doing which it receives its motion from a regulator, or governor, to be presently described. A side and edge view of one of the moveable floats is given in fig. E E, with the slot which admits of its



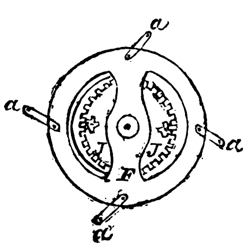
being drawn by the connecting rods nearer to the shaft *a*. C C are cistern plates,

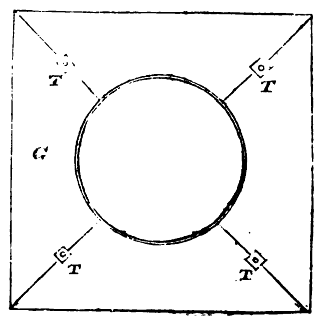


which rest upon ledges. B is a centre piece,



which I employ to connect the wheel to the shaft. T T are the bolts which connect and support the cistern pieces.





"The regulator, or governor, acts upon the same principle with those used for steam-engines and other machinery, and is only so modified as to adapt it to the purpose to which I apply it. U V are the centrifugal balls, the jointed arms, N, of which act upon the sliding collar L. There are two wheels, M M, which I call the upper and lower blank wheels. In the upper blank wheel the collar L turns freely, whilst it is so connected with it by means of a ring and set screw, as to cause the two to raise and lower together. The two blank wheels are connected by the two bolts *h h*, and two pins rising from the plank V, and passing through the ears *e e*, serve to guide them steadily. The axis of the vertical blank wheel *p*, passes through the shaft A, and has, on each side of the shaft, an endless screw, K. These endless screws take into wheels H H, placed upon the rods I I, for the purpose of causing them to revolve. When the centrifugal force is much increased, the regulator will bring the lower wheel, M, into contact with *p*, and when sufficiently decreased, will bring the upper wheel, M, in contact with it, when the wheels H will be turned, and the pinions T T, on the lower ends of the rods I I, taking into the teeth in the openings in the plate F, and causing it to turn, will open or close the moveable floats. At a medium speed, neither of the wheels M M, will be in contact with *p*.

"The regulator may, if preferred, be detached from the shaft, and carried by a band or otherwise, and be geared so as to operate on the rods I I; it may also be dispensed with entirely, and the wheel *p*, or some appendage operating in the same way, may be turned by hand, so as to set the floats in any required position.

"The cistern pieces C C, I prefer to make of wood, as they produce less friction than iron, when accidentally brought into too close contact with the wheel; and they are also, when worn, more readily and economically adjusted than if made of metal. As the water is admitted both above and below the wheel, its pressure is equalised, so that the weight of the column is not felt on the step. The two orifices likewise tend to give a full and equable supply of water to the wheel."

THE UNDULATING RAILWAY.—MR. BADNALL'S FURTHER REPLY TO HIS OPPONENTS.

(Concluded from page 424.)

Mr. Cheverton remarks that it is quite unaccountable that I do not advert to the resistance of the air as being the immediate and *only* efficient cause of bringing about uniform motion, but that I speak of *periphfugal force*, and the diminution of adhesion to the railway, as producing it, "though the former, it is surmised, belongs to the *category of non-entities*, and the latter is only a *negative* condition, or *accidental cause*, similar to a neglect of fire, a frost on the rails, or the like," &c.

Can Mr. Cheverton be speaking seriously when he thus writes? Or has he ever thought it worth his while to ascertain the correctness of his notions by practical experiment?

The resistance of the atmosphere the means of producing uniform motion on a railway! Mr. Cheverton may as well tell me, and with as much truth, that the power of his single arm could, opposed to otherwise unrestrained locomotive power, be the means of producing uniform velocity!

Let him, for one moment, reflect upon the result of a loaded train of carriages, weighing 100 tons, descending, under the influence of gravity, an inclined plane of interminable length: at what velocity does he conceive the resistance of the atmosphere would be able to produce *uniform motion*?

Again, let him imagine (which he can, if he wish it, daily witness,) a similar load conveyed along a level surface, by an engine fully competent, in point of power, to overcome the retarding force of friction, and with a full and constant supply of steam at command: how long does he consider this "*constant*" power would be able, with such a load, to produce an uniformly accelerated velocity? or, in other words, how long would it be before that engine and load attained a *maximum* velocity?

With regard to the first position, he evidently knows, and correctly understands, that the maximum velocity could not, *on the descent*, be attained until *the resistance of the air became equal to the force of descent*, or *to the relative weight of the moving body*.* And at what velocity would this occur? He must bear in mind that the moment the train begins to move, the atmosphere itself is in *cor-*

* See *Parkinson* on the Motion of Bodies in Fluids, *Cor.* 2, page 177, whose formula is as follows:— $\overline{W-w} \times \frac{3c2}{4ds} = w$. And this velocity consequently, or $2c = 2\sqrt{\frac{w \times hds.}{3 \times \overline{W-w}.}}$

responding motion, and AS rapidly as the train advances, is the position which it last occupied filled up by air. The atmosphere *does not become compressed*, nor would it *ever* become compressed in open space, until the train (which in practice is impossible) moved at more than 883 miles per hour; and for the following reason: the velocity of air, rushing into empty space, is estimated to be 1296 feet in 1″; therefore, at less than 883 miles per hour, a vacuum behind the moving body *can not be formed*, consequently *there can be no compression of the atmosphere in front*. It is for this reason that, at the greatest velocity which has hitherto been attained on the Liverpool and Manchester railway, *no inconvenience* has been experienced, and *no* perceptible diminution of power has resulted from the, at first dreaded, resistance of the atmosphere. I do not, of course, allude to the atmosphere when the WIND IS HIGH; though *even in this case* a head wind is not productive of half the inconvenience which is experienced from a *side wind* (or wind abeam). The latter produces a pressure of the flanches against the rails, which very much increases the friction, whereas the former is seldom found to make much difference in the velocity which the engine is capable of attaining.

Your readers will, I hope, pardon my inviting their particular attention to this part of our discussion, especially as I feel myself led by Mr. Cheverton to touch upon a subject which I had intended to introduce to the public, for the first time, in a separate and distinct publication. Whatever opinions may be entertained as to the resistance of air as affecting either falling or other moving bodies, I feel fully justified in the declaration of my opinion, that all bodies (as long as their specific gravity is greater than the specific gravity of the air through which they fall,) supposed to be falling from the surface of the earth to its centre, or from a very lofty elevation to its surface, must continue to fall with an uniformly accelerated velocity, until the velocity attained be equal to that at which the atmosphere would rush into empty space. A feather,* even, to which Mr. Cheverton alluded, would, in a perfectly still atmosphere, descend, under the circumstances mentioned, with uniform acceleration, but the velocity for some time would be so trifling that its increase would be almost imperceptible. On the other hand, a descending *heavy* weight, of small compass, would fall almost as rapidly as "*in vacuo.*" According to the experiments of Sir Isaac Newton and Dr. Desaguliers, a sphere of glass, weighing 515 grains, descended *in air* 225 feet 5 inches, in 7″ 57‴. Now, "*in vacuo,*" the same sphere would, it is true, in the same time have fallen nearly 1029 feet. But this is no proof of the sphere having attained a maximum velocity: it fell rather more than 3 feet in the first second of time, instead of $16\frac{1}{12}$ as in vacuo; but at the expiration of the seventh second it was travelling through the air at a still increasing velocity of more than 30 miles per hour. There can be no doubt but that, in a still atmosphere, every flake of snow increases in velocity as it approaches the surface of the earth. I therefore draw my argument into the following narrow compass:—*If a train of carriages be descending* * *by gravity an inclined plane, their velocity must be uniformly accelerated until the resistance of the air becomes equal to the force of descent*, and this *cannot be until the atmosphere becomes absolutely compressed, which compression cannot take place until the velocity of the train exceed the velocity at which the atmosphere will rush into empty space.* I therefore again repeat, that, *in practice*, the velocity of carriages descending an inclined plane *never* can become uniform, *owing to the resistance of the air.*

Let us now turn to our second position. A locomotive steam engine, without load, has been known, I believe, to travel on the Liverpool line at the rate of fifty miles an hour on a dead level; but I think I am correct in stating, that it is the opinion of those best acquainted with this subject, that none of the engines at present constructed could possibly exceed that velocity. If, however, they were *much* heavier, and if the power were proportionate, this velocity might possibly be increased. I would now ask Mr. Cheverton what is the cause of the

* It is a question with me whether the increased density of the air, as a body approaches the surface of the earth from a very lofty elevation, is *not, in its effect* upon falling bodies, counteracted *by the increased* force of gravity.

* The commencement of the descent evidently implies that, at starting, the resistance of the atmosphere cannot obviate the force of gravity.

engine, which could travel alone at fifty miles per hour, not being able, with abundance of steam at disposal, to exceed that velocity; or, with a full train of carriages behind it, to exceed 25 to 30 miles per hour?—Will he answer, the resistance of the atmosphere?

We will, to ascertain if he be right or wrong, now transfer the engine and load to the Rainhill or Sutton inclined planes, and commence the descent by gravity alone; perhaps he will not believe me when I tell him that *the velocity*, judging by the daily result of practice, very *far exceeds* that which could possiby be attained on the level, with the same engine; and moreover, that this velocity is an *uniformly accelerated velocity*.

Mr. Cheverton may again choose to doubt my reasoning on these subjects; he may continue to speak of my "*radical misconception of ideas*"—of my "*strange ideas*" on this subject—of my "*erroneous notions*"—of my "*confused ideas*"—of "the cumbrous and operose construction of an undulating railway;" but if he cannot understand or approve of my reasoning, perhaps he will not *deny facts*. I will then direct his attention to the Liverpool tunnel, which descends from Crown-street to the Docks, and is, I think, 1¼ mile in length. Now the atmosphere in this tunnel is, of course, more likely to be compressed by the velocity of a body passing rapidly through it, than if that body moved in *open* atmosphere. Nevertheless, it is an indisputable fact, that a *maximum* velocity is not attainable in that tunnel by *any* descending load; and it is equally true, that the velocity attainable by a full load at the foot of the descent, if unrestrained, would be greater, far *greater*, than *any* locomotive engine could possibly attain on a horizontal plane.

But Mr. Cheverton says, "Undoubtedly locomotive resistance very soon exhausts the force of the most powerful engine as rapidly as it can be produced, and an increase of velocity becomes unattainable, *but such is also the case with gravity*, notwithstanding *Mr. Badnall is obliged to regard the question with a philosophic eye*," &c.

And, in another part of his letter, he allows that "uniform motion is produced because the increasing resistance of the *air becomes equal to the* acting force."

Now, *if he be right*, the resistance of the atmosphere on the railway, at thirty miles per hour, (which, with a train, may certainly be called a *maximum velocity*,) is equal to the locomotive force: the motion is *therefore uniform*; for it is unquestionably the case that this maximum velocity, as Mr. Cheverton above observes, is soon attained, and at a time when *there is abundance of steam, if it could be effectively employed.* But how is it down the inclined plane? At sixty miles an hour the velocity is *still increasing*, and the resistance of the atmosphere has *never yet been proved to check the gradual acceleration.*

These are unquestionable facts; but, according to Mr. Cheverton, the resistance of the air ought to produce a maximum velocity in each case.

Again, I would call Mr. Cheverton's attention to another proof of his error: Let him, in a *still* atmosphere, time the flight of any swift bird, such as a *swallow* or *sea-gull.* I will, from careful observation, undertake to say, that the latter bird in particular will be found to travel frequently at the rate of 2 miles per minute, or 120 miles per hour. Nature, in these very birds, has supplied me with more information on this subject than I ever gleaned from books or other observation. Have not these locomotive creatures the resistance of the air to contend against? And how vast a surface, in proportion to its power, does the sea-gull present to the opposing element? Yet the vacuum which it forms in each immeasurable point of time is as rapidly filled up, and there is evidently no compression of atmosphere sufficient to stay or limit its progress at the enormous velocity of 120 miles per hour.

It unfortunately happens that nearly all our research on this interesting subject has been confined to the effect of air on *projectiles*, or to the trial of experiments in fluids, whose varying density has much governed the result, and we have consequently founded all our notions upon the theory, that when the velocity of a body is less than 1296 feet per second, the resistance varies nearly as the squares of the velocity: but locomotive engines, as well as swallows and sea-gulls, which may be said to move through a fluid of invariable density, have satisfied me that our ideas upon these subjects are extremely imperfect.

To prove that Mr. Cheverton is wrong, I will take another position. It is calculated that the resistance to a 12 pound ball, moving in the air at a velocity of 25 feet per second, or $17\frac{1}{44}$ miles per hour, is equal to *half an ounce.* Whereas, at 1700 feet per second, viz., when the velocity of the ball would be greater than the velocity at which air could rush into a vacuum, it would be at least 200 pounds. But it cannot fail to occur to a mind like Mr. Cheverton's that the resistance of the air, as opposed to the motion of a projectile, differs very widely to the resistance opposed to a body descending an inclined plane, and acted upon by a never-decreasing power, or rolling along a horizontal plane, influenced by locomotive power. The projectile is put in motion by a single impulse, and the effect of this impulse, owing to atmospheric resistance, *as well as the attractive influence of gravity*, is constantly decreasing; whereas, in the case of the descending body, the original power is maintained, and gradually (though too minutely to render the mention of it essential) increased throughout the whole descent; and on the level railway the original impulse is renewed at every stroke of the piston, and thus that power which first overcame resistance of the air, continues to overcome it without any sensible alteration.

Thus I continue to hold my ground in opposition to Mr. Cheverton; and in answer to his request that I should make a calculation of "*how many hundred horses'* power an engine must be in order to produce a velocity of 100 miles an hour, in *opposition to the resistance of the atmosphere*," I beg to tell him that such calculation is unnecessary, inasmuch as it may be ascertained practically upon an inclined plane; and any of the locomotive engines now at work on the Liverpool and Manchester line have ample power to accomplish it, *were it not for other sircumstances altogether unconnected with the opposing element he speaks of.* In concluding this subject, I beg to be understood that I do not for one moment argue that the *atmosphere* does not offer a resistance to locomotive power, or to the force of gravity. To doubt it would be to evince a greater share of ignorance than even Mr. Cheverton would probably attach to me: *but I do maintain that the resistance of the atmosphere is not, and never can be, the cause of that limit to velocity, which we term* MAXIMUM VELOCITY, *on level railways; and, moreover, that the resistance of a still atmosphere never can* (practically speaking) *produce the uniform motion of a train of loaded carriages when descending an inclined plane.*

What, then, are the *real* causes which operate in so soon staying that uniformly accelerated velocity *on a level*, which is the result of gravity on an inclined plane, and which, if the power of steam *were constant*, and equal in intensity to the power of gravity, we might, had practice not otherwise determined, have naturally expected to see continued in like ratio?

These causes are explained in a previous part of this communication, and are simply, first, that at *great velocities* on a level the power of steam is worked, and always must be, to great disadvantage, and at a great sacrifice.

Secondly. That since the friction decreases as the velocity increases, the adhesion of the wheels to the rails becomes proportionately diminished, and thus, for want of fulcrum, the power cannot be rendered effective in producing a continued increase of acceleration.

Whereas, in the descent of the inclined plane, the power of gravity is, at all times and at all velocities, effective, and the decrease of friction, owing to the increase of speed, instead of tending to produce uniform motion, tends only to increase the acceleration.

And now for the "category of nonentities." My reason for adopting the word "*periphfugal*" has been before partially explained in my "Treatise on Railway Improvements;" and I considered the invention of the term fully warranted by its classical appropinquation to the result in which it originated. At all events I am not the first man who has added a new word to the English vocabulary: the question is, can I substantiate any proper motive for the liberty?—I will try.

We have observed that the friction is reduced as the velocity increases. How is this?

Has Mr. Cheverton ever considered how long a weight, equal to the whole weight of a locomotive engine, would be in falling 2 feet 6 inches perpendicularly? or *just as far as from the axle of the engine wheels to the ground?* If I tell him that the time occupied would be about $\frac{11}{31}$ of a second; and if the wheel be revolving so

rapidly that any given point of the periphery makes *half a revolution*, or passes from the rail to its highest elevation *in less time* than the whole vehicle would fall perpendicularly 2 feet 6 inches, perhaps he will tell me *what becomes of the weight*. The circumference of a wheel of 5 feet diameter is 15 feet 8$\frac{4}{7}$ inches; therefore, if any point in the periphery travel 7 feet 10$\frac{2}{7}$ inches, viz., from the ground to the extreme part of the wheel *in less time* than the $\frac{1}{12}$ of a second, it is quite evident to me, however foolish the idea may appear to Mr. Cheverton, that the weight of the engine could not have *pressed with full intensity on such a point*. On the contrary, the force of gravity, not having time to act vertically, is absolutely become an assistant motive power; it is gathered from the periphery in contact with the rail to the extreme part or top of the wheel, and is all thrown off between that part and where it again comes in contact with the rail. The result is, that this force very materially tends to * raise the wheels from the rails, which tendency is increased at high velocities, owing to the curvature of the earth's surface. The extreme or top part of the wheel is moving with a great velocity, whilst the point in contact with the rail (though for an immeasurably short period) *is stationary;* and yet the period of rest is so limited that before the weight of the engine can press upon it, that point is carried round *half*, nay, at 26 *miles an hour*, nearly a *whole revolution!* Sir Isaac Newton, had he witnessed the experiments on the Liverpool and Manchester railway, would, in my opinion, have perceived, in the result above stated, a most extraordinary practical confirmation of his most favourite and his noblest theory.

Now the force to which I refer is not, *as commonly understood*, CENTRIFUGAL FORCE. Centrifugal force, as in a fly-wheel, is equally distributed throughout the whole periphery, barring the unimportant difference in the density of the atmosphere at the top and bottom of the wheel. But it is far otherwise with a *rolling body:* the *centre* from which the force originates is the *ever-changeable*, though precise point *in contact* with the rail; and *this force*, which originates *at a point* in the *periphery* of the wheel, and which evidently is a cause of a *decrease in friction*, and of *increased motion*, I have distinguished from CENTRIFUGAL FORCE by the (I hope) equally classical term which Mr. Cheverton condemns.

I will not make further remark on this part of the discussion; first, because my ideas cannot possibly be committed to paper in so limited a space as your readers have a right to expect. And, secondly, because its importance warrants the devotion of much more time than I can now spare in fully developing its principles and effect.

Before I conclude I am anxious to quote a few other passages from Mr. Cheverton's letter. He says, "He (Mr. Badnall) appears to think that the continuance of such motion (uniform motion) involves an expenditure of power, independent of what is required to cope with locomotive resistance. *If such were the case, the utility of his scheme would be unquestionable.*"

Now I beg to inform Mr. Cheverton (and, for the truth of what I assert, I refer him to *all scientific men engaged professionally on railways,)* that the *continuance* of a *maximum* or *uniform* velocity does, as before observed in this letter, *involve a very considerable expenditure* of *steam power*, independent of what *is* required to cope with locomotive resistance.

If I be right, therefore, (and what engineer will question it?) the utility of an undulating railway is, according to Mr. Cheverton, *unquestionable.*

But, Sir, my object has *never been*—nor *is it now*—to submit a final decision on the merits of the "*undulating railway*" to the opinion of any man, *unless mathematical* evidence (diagrams, symbols, and figures,) as well as *experiment*, can be found to substantiate that opinion.

In the absence of these I must continue fearlessly to maintain—

That a greater velocity is attainable, by a given power, upon a curved than upon a horizontal line, commencing with the descent.

That a load, which a given power *cannot* move, on a horizontal railway, can by the same power be moved with facility on such curve.

That locomotive steam force is not, and *never can become, a* CONSTANT FORCE.

That the force of gravity (though its increase is too minute, near the earth's surface to render it an object of practical

* See Mr. R. Stephenson, senior's, letter on this subject in my Treatise.

consideration,) is not only a *constant* force, but, *in theory and in fact, an uniformly increasing force.*

That the resistance of the air, when first overcome by any locomotive power, which is constantly and equably *continued*, does not, throughout equal spaces or distances, act as an opposing force with greater intensity at high velocities than at low velocities; but, on the contrary,* it is my opinion, that the total resistance of atmosphere throughout a given distance *is less* at high velocities than at low velocities, from the inclination which all bodies, when in rapid motion, have to rise from the surface of the earth, consequently from a denser to a lighter atmosphere.

Lastly, that Mr. Cheverton is too sanguine when he anticipates, that "in our rage for speed, &c., we shall not rest content until, on a level, the air will oppose *nineteen parts in twenty* of the total resistance!" Which anticipation is by no means justified by the fact that *the greater the velocity on railways, the less has been proved to be the total friction or resistance.*

Another remark or two, and I have done: Mr. Cheverton says, *I stake my scheme on the correctness of my theory.* You, Sir, also hint that upon *my theory* I am inclined to risk the reputation of the invention. You are both *wrong.—I believe* my theories to be correct; but I cannot, even if my theories were wrong, doubt the evidence of impartial experiments—experiments which have been over and over again repeated, and the correctness of which must *first be disproved before any public railway*, IN JUSTICE *to the proprietors, can be laid down.*

On the subject of *friction* on an undulating railway I think it better to make some further observation, in order that my opponents (Mr. Cheverton, I hope, among the rest,) will either acknowledge the justice of them or shew cause to the contrary.

Supposing an undulation, whose angles of descent and ascent are (all I wish them to be) JUST SUFFICIENT to permit the force of gravity to *produce* motion, and to extend one mile, no doubt it will be allowed that the carriages would descend to the foot of the descending plane and rise a certain distance up the ascending plane; let us call this distance two-thirds.

Now, without any allusion to the comparative amount of *rolling friction* upon a horizontal and undulating line, it cannot be disputed, that if the carriage were to traverse 1 mile along a level road, a wheel of 5 feet diameter would have to revolve 336 times in order to reach its destination. The *axle friction*, therefore, which locomotive force would have to overcome, would be, if represented by *f*, 336 feet.

Now gravity, as above allowed, would, without any extraneous assistance, overcome 280 feet. *Is then the axle friction*, which locomotive force is required to overcome, (and which, in comparison with *rolling friction*, is as 18 to 6,) *the same on each railway?* I ask this without allusion to the difference in friction owing to the inclination of the road.

In a word, whether a comparison between the two roads be drawn, either as regards the *velocity* or the *friction*, my opponents will *never be able* to refute the evidence of advantage which experiments have proved. And I again repeat my firm conviction that any engineer, who constructs a railway on a dead level, where *(even if the undulations be ever so slight)* he has an opportunity of taking advantage of the assistant *accelerating force of gravity, and the consequent reduction of friction, he will commit a great mechanical error.* Whereas, I am equally prepared to say, and my opinion is supported, *I know*, by other engineers more calculated than myself to reflect deeply and soundly on such subjects, that by the adoption of even slight undulations (where deep ones are not very essential), an important saving in the expense of constructing railways, and in the wear and tear of locomotive engines, and in the consumption of fuel, would result, whilst *any required velocity* might be attained, without inconvenience, *with any load* which the engine had the *power* to *move.*

I shall not further allude to what Mr. Cheverton (page 359) has chosen to reflect upon *as my "incorrect and unguarded assertions,"* than to request him to *re-peruse* them. As to the "*earth's centre*" I hope the frequent use made by Sir Isaac Newton of the precisely *same ex-*

* If Mr. Cheverton has ever sailed by a steam packet he would, on examination, observe that the *greater the velocity*, the less the friction—(see the *water on the bow of the vessel*).

pression, may be a sufficient apology to your readers, if not to Mr. Cheverton, for my allowing him to wear the wreath of victory in this *single* instance. "*Not quite to the earth's centre*"—he shall have it so.

I feel it incumbent upon me, before concluding, to apologise for the length of argument into which my opponents (especially Mr. Cheverton) have led me. I am more sorry for this, as I fear it has rather attracted us from the *main* point in dispute. Of this you, Mr. Editor, will be the most competent judge. I am equally willing, and quite prepared, to confine my defence to strict mathematical reasoning; and I fear both Mr. Cheverton and myself will be found guilty of *philosophising* rather too much for the entertainment of your readers.

In the course of a few days it is my intention to try, with Mr. Robert Stephenson, sen., some interesting experiments on the inclined planes between Manchester and Liverpool. These, until a more suitable opportunity offers, will throw *some light* upon the subject, and will, I think, enable us to form a tolerably correct opinion as to the probable advantage of an undulating road. The result of these experiments shall be sent to you without loss of time.

Requesting your correspondent "S. Y." not to *snarl* over the bone we are contending for, because I cannot understand his mode of fighting, and hoping that Mr. Cheverton may agree with me that, in these discussions, all unnecessary allusions to infirmities of mind, &c., had better be withheld,

I remain, Sir,

Your very obedient servant,

RICHARD BADNALL.

Farm Hill, near Douglas,
Sept. 11, 1833.

P. S. I have just received your Number of the 7th instant, and have perused "S. Y.'s" remarks on Mr. Ham's problem. The mistake to which he alludes in Mr. Ham's calculation was too immediately self-evident to be any thing but inadvertent, and cannot in any way affect the comparative result of calculation on the two lines.

I think "S. Y." is, *as nearly as possible*, correct in his calculation of the time on the lower line, viz., 473 seconds. And upon the upper line the time (which he does not calculate) will be as follows:—

$$\frac{55 \text{ feet} \times 12}{2} = 330 \text{ inches, or mean velocity on the whole of the upper line.}$$

Therefore, 3 miles, or $\dfrac{\overset{\text{Inches.}}{190080}}{330} = 576$ seconds, time on the upper line.

Now according to my calculation, to which "S. Y." alluded as erroneous—

The time on the upper line was $72\frac{10}{12}$ seconds.

And on the lower line .... $61\frac{3}{12}$ ditto.

Now multiplying these results on each line by the figure 8, to equalise my calculation as nearly as possible with "S. Y.'s" we have—

$72\frac{10}{12} \times 8 =$ to *very* nearly 583.
And $61\frac{3}{12} \times 8 = 490$.

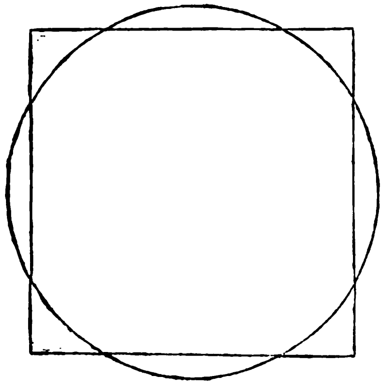
It therefore appears, and I hope "S. Y." will do me the justice to observe it, that the comparative proportionate difference in the velocity on the two lines is *very nearly*, if not quite, as correctly stated in my calculation as his.—INCLUDING FRACTIONS, what is the difference between us? Is it worth notice?

"S. Y.'s" proposition is as * 576 to 473
Mine.................... 583 to 490

I should feel hurt to find that any other correspondent than "S. Y." had doubted my proficiency in *common arithmetic*. If I commit *an error* (and I confess my liability) I will acknowledge it—will "S. Y." do the same?

* By my calculation.

MECHANICAL QUADRATURE OF THE CIRCLE.



Sir,—The accompanying diagram exhibits a mechanical quadrature of the circle effected by Mr. Heaton, which I believe to be quite original; the rule thereby obtained is sufficiently accurate for all practical purposes. From a piece of carefully rolled sheet brass was cut out a circle 1.9 inches diameter, and a square of 1.7 inches. On weighing them they were found to be of exactly the same weight, which proves that as each are of the same thickness, the surfaces must also be precisely similar. The rule, therefore, is that the square is to the circle as 17 is to 19. Mr. Heaton made a number of experiments before he hit upon the right measurement, which he has at length determined with as much accuracy as the case will admit of.

I remain, Sir,
Yours, very respectfully,
WILLIAM BADDELEY.

London, Aug. 19, 1833.

ISOMETRICAL PERSPECTIVE.

Sir,—I perceive that Mr. Baddeley has failed to give a corrrect sketch of the "Artificer's Tomb," in St. Philip's churchyard, Birmingham, (No. 525, page 391,) according to the rules of isometrical perspective. As he states it to be his first attempt, he will not, perhaps, be displeased to have his attention called to its imperfections. I conceive he drew the pedestal itself according to Mr. Jopling's directions, and afterwards attached the *section of the* pillar, in what he con*sidered a correct* manner; but as far asI, who also acquired all the knowledge of the method from Mr. Jopling's account, understand it, the whole figure must be surrounded by the circle, and the separate parts set off from the main lines *inwards*. The great advantages of this mode of projection, which can scarcely be overrated, will probably be lost sight of, through the superficial cavils of the bigots for radial perspective, and the imperfect sketches of its early amateurs. To prevent this, and to encourage and foster among the working classes a just conception of its true principles and superior claims on their attention, from its possessing all the accuracy of measurement that elevations, sections, and plans do, with the advantage of a just representation to the eye, perhaps you will allow the insertion of the following sketch. It may point out its application to representing complex figures, which former communications have not sufficiently done.

Allow me to thank Mr. Baddeley and yourself for the opportune *introduction* of the description of this tomb, and the occasion of its erection, which so strongly redeems the character of English operatives from the supercilious charges of the American evidence before the Factory Commission, which appears in the same Number, and so well establishes the pretensions of some of them, at least, to a deep moral feeling, and a cultivated taste and judgment, which they of the United States might be proud to emulate.

Z. Z.

Leicester, Sept. 5, 1833.

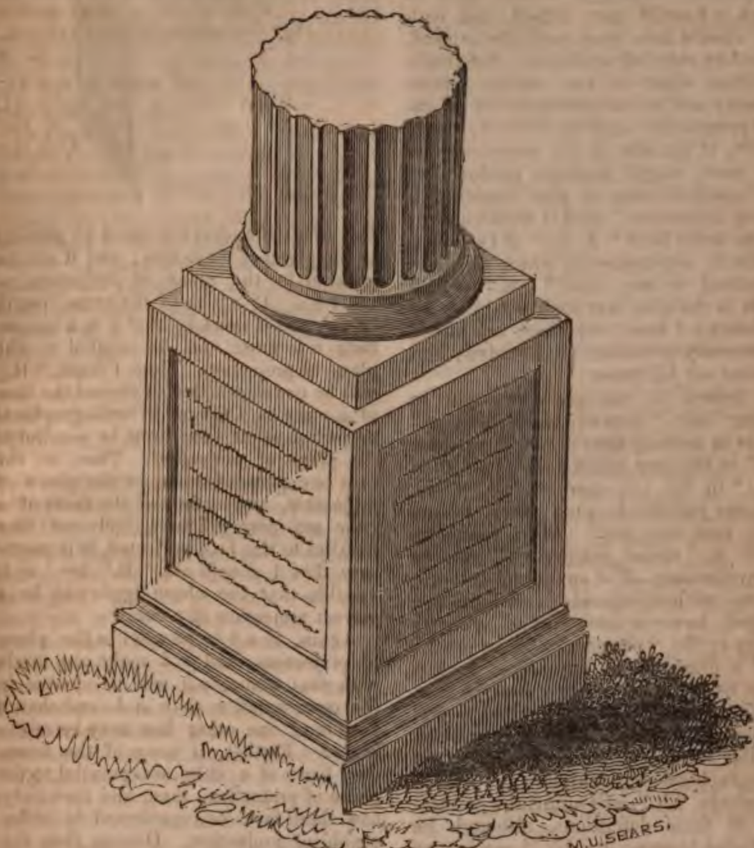
Having referred the preceding letter, and the accompanying sketches, to Mr. Jopling, he has returned them with the following note, from which it will be seen that Mr. Jopling does not consider even "Z. Z.'s" more correct representation of the structure in question quite the thing.—ED. M. M.

Sir,—Without having the correct dimensions of the "Artificers' Tomb," it would be impossible to give an accurate representation of it in isometrical perspective; but the accompanying drawing will, perhaps, explain to Mr. Baddeley, your correspondent "Z. Z.," and also to your readers in general, how such objects will appear in that projection.

I am, Sir,
Your obedient servant,
JOSEPH JOPLING.

Sept. 9, 1833.

Correct View of the Artificer's Monument at Birmingham, in Isometrical Perspective.



A FEW WORDS MORE BY MR. JOPLING ON "R.'S" NOTIONS OF ISOMETRICAL PERSPECTIVE.

Sir, — I fear "R.", notwithstanding his statement to the contrary, does feel hurt in having his supposed improvements disputed. He would not otherwise, I think, have taken the advantage of his mask of trying to cut so smartly at what be erroneously supposes were my intentions in not answering his numerous questions. This style, I think, he would not have used, if he had added his real name, *his age*, and his address to his communication.

Having again referred to his letter of *the 3d of August,* I find *seven* notes of interrogation. To the first of these he can have no idea that I should be so foolish as to attempt to reply. To the second, as I have no occasion for the article to which it refers, I must leave it to "R." himself to *set* the supposed knotty dispute at rest. To the third I have replied. To the fourth, fifth, sixth, and seventh I must beg to refer "R." to the "Practice of Isometrical Perspective," which, I think, will prove that it is applicable to the representation of objects in every possible position, with respect to the plane of projection.

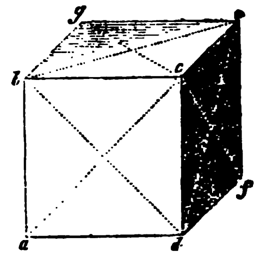
I beg again to thank "R." for what he has said in favour of "isometrical perspective," which is indeed quite as much as I could have wished, and with it I should have been perfectly satisfied, if he had only left *well alone;* but thinking that what he has, perhaps, more strongly said in recommendation of radial perspective, and his favourite angle of 30°, if not also of the perspective of the press, might, perhaps, produce on the minds of some of your readers "a wrong impression," (and it would appear by the letter from "Z. Z.," of Leicester, a sketch accompanying which you have submitted to me, that I am not singular in the idea that such would be the tendency,) I have, therefore, considered it necessary to caution your readers, and to point out his errors.

I believe I was perfectly right in stating that "isometrical perspective" differs in nothing from "radial perspective" in the case which I supposed, than that "in the one case several of the lines are parallel to each other, in the other case not any." The vanishing points in "radial perspective" may be at any distance—if at an infinite distance, the two methods coincide; and I am now obliged, however unwillingly, again to advert to the "perspective of the press."

If a projection of any object upon a plane be made, by drawing straight lines or rays from a point, it is called *a perspective representation;* but if formed by parallel lines or rays, it is called "an orthographical representation."

Perhaps "R." will admit the correctness of these definitions, although he has failed to prove that his "perspective of the press" belongs to either; and now, evidently doubting, he invites me to shew proof that it is "*false projection.*"

In orthographical representations it is usual to consider the rays by which the projections are made as perpendicular to the plane of projection. This, perhaps, "R." will also admit. If so, I would beg to ask him, how he would plan a cube, with respect to the plane of projection, so that one face of it shall be projected as a square, and yet two other faces be represented, as he has given in the following figure? Without waiting for "R.'s" reply, allow me to state that it is impossible.



To represent a d, for example, of the *same length* as a boundary line of one face of a cube, that line must be parallel to the plane of projection; and if *a d* be parallel to the plane of projection, so must *b c*. If *a b* is of the same length as *a d*, and it must be so if it is a square, then *a b* must also be parallel to the plane of projection. Thus, I hope, "R." will be convinced that to project the face of a cube as a square in orthographical projection, that face must be parallel to the plane of projection. Then, as the rays are perpendicular to the plane of projection, and as four of the faces of a cube are perpendicular, and one face parallel to the face projected, is it necessary that I should ask "R." how is it possible that the above figure can be a correct projection of a cube?

Again, if *a b* be parallel to the plane of projection, and *a b* make any angle with that plane, *a b* will be shorter in the representation than *a d*, and then a portion of one other face may be represented. Farther, if none of the boundary lines of a cube are parallel to the plane of projection, then, and then only, can three faces be represented in orthographical projection. Hoping that this will convince "R.," and also your readers, that he has been in error, and trusting that he will not exhibit any marks of displeasure for being thus corrected,

I remain, Sir,

Yours respectfully,

JOSEPH JOPLING.

IMPROVED FIRE-PLUGS.

Sir,—The fire-plugs in Birmingham are constructed in a manner which the Metropolitan Water Companies would do well to copy: they have cast-iron tops like our own, but they also have, in addition, a circular piece of iron, rather conical, which fits into them, and makes an even surface, flush with the pavement.

This simple contrivance prevents those accidents which frequently occur with us from the legs of children and animals getting into the plug-holes; it also keeps out all dirt, and when the plug is required to be drawn, the turncock puts his *needle* into a slit made for that purpose, lifts out the iron stopper, and immediately opens the plug.

In London it frequently happens that the plug is completely choked with straw, dirt, &c., which occupies much time in removing before the plug can be got at, causing a delay, which, in case of fire, has proved a serious matter.

This improvement is also of equal importance for closing the opening to stopcocks, &c.; the additional expense is but trifling, while the advantages are very considerable.

I remain, Sir,
Yours respectfully,
William Baddeley.

London, Aug. 16, 1833.

PAROCHIAL GAS-LIGHTING.

Sir,—In reply to Mr. Rutter's inquiry in his last, I beg to inform him that the simplification of the process of gas making, as far as it has been hitherto developed, appears to involve no new principle, but to consist entirely in the application of the many great improvements made in gas manufacture of late years, to its production on a much smaller scale than has usually been considered practicable, if a profitable result were looked for. The principal object of the projector, Mr. Gude (the former Secretary of the chartered Company), is, to enable single parishes to make their own gas, instead of, as now, obtaining their supply from a large company. His plans appear to be hardly yet matured, and it may reasonably be doubted whether one half of the advantages he holds out will ever be realised. His zeal seems to be too much the growth of his indignation at what he takes to be his ill-usage by the Company in whose service he has been.

Before concluding, perhaps, Mr. Rutter will allow me to put a question in return, purely, I assure him, for the sake of information. Is Mr. Rutter's process the first which has been invented for making gas from water?

I am, Sir, yours respectfully,
F. H.

Sept. 13, 1833.

SMOKY CHIMNEYS.

Sir,—I have long had a desire but have hitherto been prevented noticing "A Bricklayer's" communication, vol. xviii. page 281. I was particularly well pleased on seeing that paper, because I am convinced, if practical persons do but give the subject of constructing chimneys attention, much good may be expected to result from it. Your correspondent has not yet given any account of his reasons for his method of constructing flues. Judging from the sections he has given I should suppose he still entertains an opinion, which indeed is perhaps almost general, that chimneys ought to be well gathered in. This, I think, will be found to be a grand error, and the cause of at least ninety-nine in every hundred smoky chimneys.

I am, Sir, yours, respectfully,
Joseph Jopling.

STEAM-CARRIAGES ABROAD.

We learn, from a correspondent at Brussels, that King Leopold is taking a very active part in the introduction of steam-carriages into Belgium, which, being generally a flat country, is extremely well suited to vehicles of this description. His majesty has appointed a commission, consisting of Count Hompesch (president), Count Vilain XIV., M. Engleo, banker, Colonel Schenofsky, and M. Jobard, manufacturer, to watch over the progress of this improved mode of transport, and to facilitate its general adoption by every possible means. The chief Belgian competitors in this line, at present, are, M. Dietz, senior, (the inventor, we believe, of the steam-engine lately described in this Journal,) and a M. Couchans, of Charleroi, both of whom have been making experimental trials, with carriages of their own construction, in the neighbourhood of Brussels. The carriage of Dietz seems, from the description sent to us, to be rather a stupendous affair—eight tons weight, and fourteen feet high! It is hung, however, on springs—enormous steel springs (*sur d'enormes ressorts d'acier*). The boiler is composed of six elliptical chambers, placed in pairs one above the other, which contain altogether 240 square feet of heating surface. There are two pistons, which turn two cranks, which turn two pullies, which carry two endless chains, which turn the two hind wheels, by which (alone) the carriage is propelled. There is but one wheel in front, and that is used as a guide wheel. The engine is stated to be able, in ascending hills, to exert a power of 120 horses, and there

appears to be some arrangement by which in such cases the wheels may have the help of cogs (*sont garnies de billets de bois de bout*). The rival steam-carriage of M. Couchans has four wheels, and a separate cylinder and piston for each wheel. The circumference of the wheels is stated to be "elastic," which means, we presume, that they are constructed on the give-and-take principle of our Messrs. Jones and Company's patent wheels. The results of the experiments hitherto made with these carriages are but indifferent. The greatest speed realised is likened to the "*galop d'un bon cheval.*" However every new exhibition attracts "*une grande affluence de curieux*," and is concluded "*au milieu des bravos de la foule*;" and at Brussels, as in London, no doubt is entertained, by the generality of people, that the day is close at hand when steam carriages will be the only vehicles in vogue on common roads.

A FEW MORE GLEANINGS FROM THE FACTORY COMMISSIONERS' REPORT ON THE STATE OF MANUFACTURES IN AMERICA.

Alexander Pitcairn, Mule Spinner, at Messrs. Matthew Brown and Co.'s Cotton Spinning Mill, Johnstone.

Deposes, that he is a mule spinner at this work, and at present makes about 25*s.* a week; that his wheels contain 528 spindles; that seven or eight years ago he at this work made from 28*s.* to 30*s.* per week, but at wheels containing 712 spindles; that he at present pays his piecers, one at 5*s.* 6*d.*, one at 3*s.*, and one at 2*s.*; that about three years ago he went to New York, with his wife and four children, with the view of bettering his fortune as an agriculturist; that in two or three months he got into a cotton mill, of Mr. Pearson, at Rammapool, 30 miles from New York, and about 18 from Patterson; that he worked as a mule spinner at wheels containing 552 spindles, the heaviest he saw in America, and he was at Patterson and other places; that he always made at least six dollars a week, besides paying his piecers, but never more than seven dollars; that the wages of piecers are two dollars, and sometimes two dollars and a half, and he calculates on paying his own children, who were his piecers, two dollars each; that he considered the American machinery, everywhere where he was, quite inferior to ours, and would never be afraid of competition with the Americans, while they manage their factories as at present, with the people coming and going as they choose, and jaunting about as they like; and he is certain that here, with 528 spindles, he can produce double the quantity of yarn of the same quality; three times that quantity, as he inclines to think, that he could do at Rammapool with 552 spindles; that this is owing to the inferiority of the machinery, and the work not being so regularly carried on; that he got as high wages as were given to any spinner at Rammapool; that he returned from America about two years ago, because he had promised that if he did not succeed as an agriculturist he would return, and when he saw the country he did not like to settle in the woods; that he did not think the people in the United States behaved any otherwise to his family than to natives, but he did not like them because they are not a social people; that if he had no attachments in this country to draw him back, he certainly would have been far better off to remain, with his wages, and the rates of piecers for his children, in the United States than here.

Isaac Collinge, Master Cotton Spinner, Rochdale, examined.

Was an operative 34 years before he was a master; has worked in the United States, six years and ten months at the Falls of Schrilkyll, four miles from Philadelphia; it is eleven years since he returned. Worked there in summer from sunrise to sunset, that is, from half-past four in the *morning* to half-past seven at night. In winter they worked twelve hours. Half an hour was allowed for breakfast, and half an hour for dinner. The meals were generally taken out of the mill; but they pleased themselves, as they do here. The factory was well ventilated; but it was heated with stoves, which was rather oppressive. About sixty boys and girls were employed, at all ages, from ten, which was generally considered young for them to begin at. The children were not badly treated; never saw one injured either there or here. Never heard in America of such a thing as factory labour stunting the growth of those employed in it, or that it was less healthy than other employments. Their machinery was not then so good as our own; but at the present day they have as good machinery as we have. The greatest part of witness's family is now engaged there in factories, and keeps up a regular correspondence with them. Does not know that they have any machines which we have not, except spinning machines in woollen mills, which are superior to any thing we have in this country. These machines are superior to ours, because they are principally worked by power, and here much by hand. Should imagine that an establishment of equal size in America (for wool spinning) will turn off about one-fifth more than the English one; but does not think they have any other machinery superior to ours. The few mechanics they have are quite

equal to our own. Several of our best artisans have left this country in the last fifteen years, and gone there. We do not now export much machinery to America; they make their own, and quite as good as here, but it costs more money. Throstle spindles are about 8*s*. here, and 12*s*. there. From the accounts witness has, should think that machinery is one-third dearer there than here in general, which is owing to the price of labour being greater, and steel being more per pound, iron also—the chief difference is in labour. The manufactures in which witness's family in America are engaged, are stripes and gingham; has seen specimens of their production quite equal to our own in goodness, but not quite so cheap. If a sixth, however, be taken off our time, they will beat us; is certain of it. Our bread and cotton is taxed, and they have the cotton growing near them, though the price of cotton is not above a farthing a pound dearer in those parts of America where they manufacture than here. They (the Americans) manufacture every thing but fine goods—ginghams, stripes, shirtings, bed-ticks, sattinets, kerseymeres, and broadcloths; they keep increasing their manufactures every year very fast. All these coarse goods are quite equal in quality to our own, but a little more in price, not much. The labour is dearer, but that is partly made up to them by the lowness of provisions.

Mr. Robert Hyde Greg, of the Firm of Messrs. Samuel Greg and Co., Manchester.

Having been interrogated as to the state of manufactures on the Continent (his evidence respecting which we shall give in a future Number), the witness's examination proceeded as follows:—

Are you acquainted with the state of the cotton manufacture in any other foreign country?—The documents I have put in refer to every country with which there is the least danger of competition, except America, with respect to which my information is only general; but I know, on good authority, that their consumption of cotton is about one-fourth of Great Britain; that their mills are rapidly increasing; that their cotton goods meet those of England in extensive competition in some foreign markets, particularly in South America; that their machinery is good, and their hours of work from thirteen to fourteen a day.

Have not the late improvements in machinery come from America?—Four of our most valuable and ingenious machines have been introduced from America; the patent reed making, patent card making, Dyer's patent roving frame, and Danforth's throstle. It may be remarked here, respecting the hours of mill labour in America, that if in a country where there is no surplus population, where ready employment, at good wages, is within every one's reach, where land may be obtained at a dollar and a half per acre, where the wages in mills seem to be lower in proportion to those in other occupations, compared to what they are in this country, plenty of operatives are found to work themselves in these mills, and to bring their children to work in them, it is clear that the people there do not consider employment in mills for that length of time (thirteen or fourteen hours per day) to be a grievance. We have no reason to suppose that employment in the mills in America is free from any objection to which it is exposed in this country.

Mr. H. H. Birley, of Manchester, to prove the fact of the increase in foreign production, produced, among other documents, the following:—

Sixth Document.—*Paper from John Bradshaw, Esq., Principal of a house in Manchester, having an establishment at Rio de Janeiro.*

"From our establishment at Rio de Janeiro our advices, dated in January, 1832, notice the import of cotton manufactured goods, with the remark—'when the Americans arrive with a quantity of cotton goods it always checks our sales.' During the year they have repeatedly noticed the large and increasing imports from America of cotton goods, with the low prices at which they were selling, observing, that the market was so filled with some descriptions of articles from these sales, that they requested us to desist shipping any more of such goods for a while. Our letters from Rio, dated in December last, continued to notice the large sales by the Americans of cotton goods:—'You will be aware that their heavy and coarse cotton cloths have a preference, being made wholly from a superior quality of cotton to that used in such cloths by us.' We have also advices from Havannah of large imports from America.

"Signed JOHN BRADSHAW."

Seventh Document.—*Extract from a Report of the Committee appointed at the New York Convention, for Twelve States of the Union. Copied by William Garrett, Esq.*

"In twelve States of the Union there was a capital employed, in 1832, in the manufacture of cotton, of 44,914,984 dollars. The number of yards of cloth manufactured was 230,461,990, and the number of pounds of cotton was 77,516,316, as much as was consumed in this country little more than twenty years since."

MR. HANCOCK'S STEAM CARRIAGE "INFANT"—TRIP TO BRIGHTON.

We extract the following particulars of a very successful trip made by Mr. Hancock's steam carriage "The Infant," to and from Brighton, from a letter sent by Mr. C. A. Busby, the architect, who personally witnessed part of the performance, to the *Brighton Herald*. This carriage is the first that was constructed by Mr. Hancock, and does not include his latest improvements:—

"Mr. Hancock and party started from Stratford, in Essex, three miles and a half east of Whitechapel, a few minutes before six o'clock on Wednesday morning (11th inst.), and arrived at Brighton forty minutes after three, having transacted, when in motion, at the pace of 12 miles per hour. The whole distance from Stratford is about 57 miles, and all the time not occupied in progression was expended in taking in water and coke, and in that no less necessary operation of breakfasting and dining on the road. * * * Next day the steam carriage made a *detour* through the Grand Parade, Church-street, &c.; but on returning along the Cliff, unluckily an inferior part of the mechanism, technically called a *clutch*, gave way, and led to the fracture of a cogged wheel which gave motion to the centrifugal fire funnel, and the carriage was brought to a dead stand. * * * On Friday, every thing being set right, the carriage was started again. It went westward to the extremity of Adelaide-crescent, and turned round; it then came up the Wick road to Brunswick-terrace, and proceeded along the Cliff to the Chain Pier entrance; then back again to Brunswick-terrace, and returned along the Cliff through East-street, North-street, &c., to the tank at the New Church, whence, after taking in a charge of water and coke, the carriage proceeded on its way towards London. * * * * Captain Heaviside and myself had the pleasure of accompanying Mr. Hancock to the Pitt's Head, sixteen miles on his road homeward. The distance was accomplished in one hour and forty minutes, twenty minutes of that time being spent in taking in coke, and in procuring water from ponds at various places as they presented themselves on the road. The stoppages, under an *organised* system, would not require six minutes."

The remainder of the journey to town was performed, we understand, at the same rate, and without the smallest interruption, except what was occasioned by taking in the requisite supplies of water and fuel.

Captain Back.—Letters have been received from Captain Back, dated the 19th of June, from Jack River, a small depot and trading post of the Hon. Hudson's Bay Company at the north-west extremity of Lake Ouinipique, in which Captain Back reports himself and party in excellent health. He also expresses himself much satisfied with the arrangements made and zeal manifested in the interior to facilitate the object of the expedition. The following is *verbatim*:—"As the season is fast advancing, I purpose proceeding immediately in a light canoe, to find out the Thleu ci cho, and also to select a wintering station, which may be effected before or by the time my heavy barges reach the Athabasca, and by this means they will be enabled to come on direct to the end of their journey."—*New York Paper*, August 20.

A Royal Wonder.—The Burmese heir apparent is an extraordinary man. He is self taught; and, although of naturally good talents, he is very timid, and much alarmed that his turn for scientific subjects should be known to the king and ministers. A gentleman, who has also an inclination that way, and has seen him frequently, declares him to be a wonderful man; and if in any other country, where he could, without fear, follow the bent of his mind, he would soon prove himself a person of superior acquirements. He is anxiously looking out for a comet that is to appear this month, and which, I believe, by the calculations of some French astronomer, is to destroy the earth. He has a good telescope—a thermometer—a barometer—a stomach-pump—and, I believe, an air-pump, all of which he is obliged to keep shut up. Subjoined, are some questions put by him to a gentleman here, which, it is hoped, some one may be able to solve to his satisfaction:—1st. He has observed, that the last three comets have appeared in the same sign in the heavens that the moon's node was in at the time. Is this accidental, or has the node any connexion with the comets?—2d. On what data does Sir Isaac Newton found his hypothesis of the heat of a comet being 900 times greater than red-hot iron?—3d. Is not the height of the atmosphere increased at new and full moon in the same manner that the waters of the ocean are raised, but to a much greater extent? If so, why does not the barometer indicate it by rising.—*Journal of the Asiatic Society.*

An Old Stager.—In the cotton spinning mill (Aberdeen), one very remarkable person was pointed out, and examined, viz., Betty Robinson, aged 53; who had been 26 years wheeler in this mill, and has always worked on the same spot. Last year the floor on which she stood so long was found to have been worn through and through by her feet, down to the joist or beam, and was replaced at that spot. She is at this moment in good health. —*Sir David Barry.—Factory Report.*

INTERIM NOTICES.

B.—We are obliged, but the Treatise alluded to has already been dissected by another hand. The Report shall appear soon.

Nemo will find, by examining our 11th volume, that he has been anticipated.

A Correspondent is desirous of obtaining the address of any wholesale house where he could purchase some purified manganese (the protoxide). He has applied at several houses but can only get the common and *impure oxide*.

We shall give in our next some further particulars of Mr. Rutter's new process for generating heat; also an interesting letter on the subject from Colonel Macerone.

Communications received from Mr. Dickson—A. B.—S. D.—Trebor Valentine—Pit—S. Y.—A Subscriber—Mr. Wilkins.

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NEW FIRE ENGINE AND FIRE ESCAPE.

Fig 2 Fig 1

Fig 3

Fig 4

PLAN FOR THE COMBINING MEANS OF ESCAPE FROM FIRES WITH THE MEANS OF EXTINGUISHING THEM; WITH SKETCH OF AN IMPROVED SYSTEM OF FIRE POLICE.

Sir,—Having frequently read in your popular Journal articles on the subject of fires, I beg leave to offer for the favour of a place in its pages the following description of a fire engine and escape, on a new principle of construction, with a sketch of an improved systen of fire-police.

Numerous plans have been at various times submitted to the public, and a variety of inventions proposed, for the preservation of persons in cases of fire, but none of them appear to have been brought into use; and the loss of life from fire continues as lamentably frequent as ever.

A machine, or apparatus, for the purpose of a fire-escape, should be not only of the most simple and efficient construction, but capable of being applied with the greatest facility. If ever so perfect, it cannot be considered of practical utility unless the mode by which it can be obtained and brought into service is equally efficient.

The Fire-Engine establishment recently formed by the principal insurance companies of the Metropolis is an important improvement upon the old system; but it seems to have in view rather a better management of the engines, for the purpose of more speedily subduing fires, and thereby saving of property, than the preservation of life. It does not appear to possess any machine or apparatus, or other contrivance for the latter purpose, with the exception of ropes, and a canvass sheet to be held by hand, to receive persons who may leap or throw themselves upon it from a building on fire—a species of aid which there is reason to expect many individuals, particularly invalids, females, and children, will not often be able to avail themselves of. Besides, the stations of the metropolitan fire-engine establishment, though numerous, are at too considerable a distance from each other to furnish in all cases with sufficient celerity the means of escape to persons in danger. The first appearance or breaking out of a fire is the period of time when assistance can be afforded most effectually; and often the delay of a few minutes, in the arrival of the means of escape, renders them useless and unavailing. The parish engine and fire ladders, the readiest means at present provided, are placed in charge of the beadle, or some other parochial functionary, who, upon an alarm of fire, hurries with such casual assistance as he can obtain to the scene of action, where, in four cases out of five, he arrives too late for his small engine to be of any effect, and his ladders are too short to reach the unfortunate inmates whose lives are in jeopardy.

It is submitted, that a mode preferable to the existing parochial one would be found, by placing the means provided in charge of that necessarily active and responsible power, established for the protection of the lives and properties of the public by night and day — the police, which, from its present extensive and effective state in the metropolis, possesses every requisite qualification for the purpose.

It is therefore proposed—

1st. That an engine and fire ladders, or other suitable means, should be placed at every police station, where there would be a sufficient number of men in readiness, upon every emergency, for the service required.

2d. That every policeman, upon the discovery of a fire, should communicate the circumstance to the next man on duty, and he to the one next to him, and so on successively, till the fact was made known at the nearest station-house, and likewise at the first adjacent station of the fire-engine establishment: such communication to be made in any manner found best calculated to ensure certainty and despatch.

3d. That a certain number of men at each police station should be regularly exercised in the conveyance and management of the fire engine and fire escape; and likewise that the engine and escape should always be in perfect condition, and fit for immediate use.

The accompanying designs represent a fire engine and fire escape combined in one; likewise a separate escape ladder, which can be elevated to any height, or placed in any position required, and may be either employed for the relief of persons in danger, or as a means of enabling the firemen to throw water into

any apartment or part of the building, with speed and effect.

The principle of construction here adopted appears particularly suited, from its simplicity, for the class termed "parish engines," as an engine on this plan can be worked with facility by two men, and, from its superior power, to the ordinary engines of that description, could act with considerable effect till the arrival of the first class engines. The apparatus attached to the engine would, it is submitted, be found of real utility, in cases of emergency, to escape from a building on fire. A sail cloth, or sheet of canvas, held by persons in front of a house, has been found, by experiment, to preserve from injury any one falling or leaping upon it. The mode proposed, of suspending the canvas to extended poles fixed to the machine, would, from the facility with which it can be used, and the considerable extent to which it can be spread and elevated, enable it to act with increased effect and advantage, and, by being connected to the engine, the apparatus would consequently be always conveyed without delay or inconvenience, to be used according to circumstances.

The strength and simplicity observable in the construction of ladders, have caused them to be generally provided for the purpose of fire escapes, but their want of sufficient length, and the difficulty attending their conveyance to any distance, render them of little avail in cases when most required. These disadvantages are obviated in the description of ladder I propose to adopt. It is constructed upon the sliding principle of three lengths, and can be elevated with rapidity by a simple mechanical operation, to any height, and be placed in whatever direction or position required. By being supported too upon a light four-wheeled machine, it can be conveyed and worked by moderate aid with facility and despatch.

The accompanying rough sketches which I have made of the proposed machines, are intended to represent them as follows:—Fig. 1 shews the engine at a building on fire, preparing for use. Fig. 2 the escape ladder similarly engaged. Fig. 3 the ladder machine going to, or returning from, a fire. Fig. 4 the engine in the same act.

I have not furnished the details of the construction of the machines, considering that there are various parts, the form and arangement of which might require to be different, in a proper sized machine, to that planned upon a small scale, and particularly as I have constructed models of the machines for the inspection of individuals who may be desirous, from the foregoing statement, to promote their adoption, or to aid in carrying into effect the improvements which I have suggested in the system of fire police. I have left with your publisher the address of a friend in town, at whose residence they can at any time be seen,

And remain, Sir,

Yours respectfully,

ENDEAVOUR.

MR. J. O. N. RUTTER'S NEW PROCESS FOR GENERATING HEAT—FARTHER PARTICULARS COMMUNICATED BY A CORRESPONDENT AT SALISBURY.

[Nothing more is attempted in the following paper than to give a popular view of the nature of Mr. Rutter's process, and of its extensive application to practical purposes. Mr. Rutter is himself preparing for publication a work on the subject, in which it will, no doubt, have full justice done to it in all its bearings, theoretical as well as practical.—*Correspondent.*]

"The ordinary process of generating heat, whether it be in a domestic stove, or in an enclosed furnace, implies the occasional addition of some kind of fuel; the combustion of which is effected through the agency of oxygen, one of the elements of atmospheric air.

"To obtain the greatest quantity of heat from the smallest quantity of fuel, is a problem that has long occupied the attention of practical men. In our endeavours to solve it, not only do the size and construction of the furnace, the arrangement of the flues, and the properties of the fuel employed, demand our attention; but the egress of air must be so regulated, that, whilst one-fifth of its volume, by combining with the fuel, contributes to the extrication of heat, the remaining four-fifths shall not deprive us of the beneficial effects of that heat, by carrying it off at the chimney.

"Combustion, as usually conducted, denotes the union of carbon, hydrogen, and oxygen, in various proportions. That these materials combine only to a very limited extent, is attested by the volumes of smoke that we witness ascending from the shafts of

factories. This waste of fuel it is exceedingly difficult to prevent. The exposure of a furnace to a current of air, through the frequent addition of fuel, is found unprofitable. Hence it is the general practice to throw on, at one time, more fuel than is really necessary, entailing periodical waste and variableness of temperature.

"It was during the winter of 1832-3, whilst occupied in the management of the gas works at Lymington in Hampshire, recently erected there by Messrs. John Barlow and Co., that the patentee had an opportunity of making daily observations on the process of heating thus briefly described. As is the practice in most of the coal gas works in the kingdom, the tar made on the station, for which a ready sale could not be found, was consumed, in conjunction with coal or coke, as fuel. Experience taught him that, whilst on the one hand it was a measure of economy thus to get rid of an article, the accumulation of which might prove both offensive and dangerous, yet, on the other, its employment as fuel, by the means hitherto adopted, was a most wasteful process, since two-thirds, and in many cases three-fourths, of the tar sent into the furnace was evidently not consumed. Reasoning on the results of various experiments, and assured by them that the imperfect combustion of so inflammable a body as coal tar was entirely due to an excess of carbon, it occurred to him, that since water by its decomposition yields hydrogen and oxygen, that fluid, if decomposed in contact with the tar, would render its combustion complete.

"The first experiment was successful. By delivering into a furnace, in which was a clear fire made with coal or coke, coal tar in a very fine stream, accompanied by an equal quantity of water, it was found that the whole of the tar might be decomposed.

"From the experiments and observations of the patentee, and from the communications made to him by others on whose testimony he can rely, he believes that, under the old system of burning tar as fuel, from 40 to 50 gallons may be assumed as a minimum supply for one furnace during 24 hours. In some cases the consumption, or rather the waste, has been at the rate of 70 gallons during the same time. By a series of comparative experiments, conducted by the patentee at Lymington, and subsequently at Salisbury by John Barlow and Co., it has been demonstrated that from 8 to 12 gallons of tar, in conjunction with water (varying in their respective proportions according to circumstance), are sufficient for 24 hours; the latter quantity enabling the retorts to be worked at 4 hours' charges.

"*At Lymington the* patentee has made, during successive weeks, with one 22 inch York D retort, 3,800 cubic feet of gas from 8 bushels of Newcastle coal (80 lbs. per bushel,) in 20 hours; which is at the rate of 13,300 ft. per ton, and 17,100 ft. per chaldron. A greater quantity of gas obtained from a given quantity of coal, as compared with the usual products in gas establishments, is not the only advantage consequent on these workings. The gas made under these circumstances is of superior density. In many instances its specific gravity has averaged ·550. At Salisbury nearly similar results have been obtained. With three 12 inch D retorts, 7,800 feet of gas have been made from 18 bushels of Newcastle coal in 24 hours; averaging 12,124 feet per ton, and 15,600 feet per chaldron.

"The heat generated by the combustion of tar and water, although much more intense than that arising from ordinary fuel, may nevertheless be regulated at pleasure. It is, moreover, uniform in its effects,—a point which can only be appreciated by the practical gas maker.

"Let it not be inferred that the exalted temperature exhibited in this process depends simply on the entire combustion of the tar. Water, by it decomposition, affording materials whose heating properties are inconceivably more energetic than the ordinary kinds of fuel, and its elements combining readily with carbon, it is easy to comprehend how these materials mutually aid each other. The quantity or intensity of heat generated by a comparatively small quantity of fuel, is due, therefore, to the presence of water.

"Another condition of the process should not be overlooked. It has already been hinted that oxygen constitutes only one-fifth of the air admitted to a furnace, the remaining four-fifths taking no part in the ignition of the fuel. In the process here described, oxygen, instead of being admitted in any great quantity from *without*, is generated *within* the furnace; and instead of its being accompanied by azote, which retards combustion and extinguishes flame, it is accompanied by hydrogen, one of the most inflammable of the gases.

"The importance of this process in gas operations has been first mentioned, because to that department of science it owes its origin, and, up to the present time, the greater part of the proofs illustrative of its utility. There is, perhaps, no purpose for which heat is required in an enclosed furnace to which this process is not applicable. Steam-engines, whether stationary or locomotive, breweries, distilleries, glass-houses, the cabouse of the merchant ship, and the galley of the man-of-war, are

favourable situations for its employment. The absence of smoke, also, gives to it additional importance in cases where the ordinary process is considered a nuisance.

"Time and experience will doubtless unfold many valuable suggestions. All the patentee's experiments have been conducted in furnaces of the ordinary description. In the construction of furnaces much yet remains to be done. In the place of such a widely extended stratum of fuel as is now required under steam-boilers, &c., a surface just sufficient to effect the decomposition of the materials will answer every purpose.

"A condition peculiar to a furnace for heating gas-retorts is the great extent of heated surface to which the fuel is exposed. Under such circumstances, it is found that tar, both mineral and vegetable, will take considerably more than its bulk of water in its combustion. In a furnace over which is set a boiler, the only decomposing surface is that formed by the sides of the furnace and the fuel on the grate-bars. The relative proportions of the inflammable body, and of water, necessary in such cases, vary materially. In three experiments on board the "Glasgow" steam-packet, it was found that about equal quantities of tar and water were consumed. The sides of the furnaces in that vessel form a part of the boiler: consequently their temperature never exceeds that of the contained water.

"To estimate with accuracy the relative heating properties of the materials applicable to this process,—which comprise bituminous, oleaginous, resinous, waxy, and fatty substances, in a fluid state,—as compared with coal and coke of various kinds, and other fuel, will require an extensive series of experiments. Practical men would do well to make known to the patentee, from time to time, the results of their observations. That kind of information will enhance the value of the process by rendering its conditions better understood. According to the patentee, if the process be properly conducted, 15 lbs. of coal tar (weighing about 11 lbs. per gallon), or the same quantity of Stockholm tar, with rather more than an equal bulk of water and 25 lbs. of Newcastle coke, will be found equal to 120 lbs. of Newcastle coal.

"The cost of the process, as compared with that ordinarily employed, must necessarily depend on the relative cost of materials.

"But there are situations in which the relative cost of materials does not constitute the *only* consideration. For steam navigation, and especially in long voyages, fuel is not simply a question of cost, but of stowage. The period seems now fast approaching, when communications by steam may be established with every part of the globe."

NOTE ON MR. RUTTER'S NEW PROCESS FOR GENERATING HEAT. BY COLONEL MACERONE.

Sir,—In this day's Number of your excellent Miscellany (527), you give an account of "Mr. Rutter's new process for generating heat." Without disparagement to Mr. Rutter's genius, or wishing in the slightest degree to question the originality of his idea, I think, however, you will allow that I have a fair claim to the favour of your republishing at this juncture a paper of mine on the same subject, which appeared in the Mechanics' Magazine, No. 170, November 25, 1826. It is as follows:—

"ON INCREASING THE FLAME OF FUEL AS APPLIED TO STEAM BOILERS.

"Sir,—I should think that, from analogy, we may regard the steam, or elastic fluid engine, as being yet in the infancy of its construction and application. We may therefore expect, very soon, to see the huge furnaces and boilers, now used for the generation of steam, at so great an expense of fuel and of room, superseded by a more economical and compact contrivance.

"As, however, most of the engines at present in use are worked with such great boilers and furnaces, I will trouble you with an idea of mine on the subject, on the mere chance of its possibly having some practical utility in it, of which most of your readers will be better able to judge than myself.

"I am told, that the most efficacious mode in which heat can be applied to the boiler, is that of *flame*. That fuel, therefore, is the best, which, in a given weight and bulk, will produce most *flame*.

"In the steam-engines I have had an opportunity of inspecting, part of the incandescent coal or coke is raked out of the furnace as soon as it ceases to give out *flame*. This suggested to me the idea whether oil, fat, or coal-tar might not, under particular circumstances, be injected into the fire-place, so as to keep up an abundant *flame*, to which the glowing coke would serve as a kind of wick? The injection might be performed by the engine itself, through several little beaks in the sides of the furnace, subject to the complete control of the engineer.

"Would not one cubic foot of oil, or tallow, or tar, produce more flame than a cubic foot of coal? Might not a steam vessel, on certain occasions, economise her coals by some such substitute?—Might not such a vessel, upon falling short of coals, be perhaps able to procure oil, fat, or tar to eke them out, and complete her voyage?—May not fat, oil, or tar be met with in man

situations where coal is not to be had?—Even at sea a whale ship might supply oil enough for a long voyage, or a steam vessel might even catch some of these fat cteaceous tribe herself. Might not wood, which is to be had on every coast, with the timely application of any of the above combustible fluids, be made to furnish more *flame* than an equal bulk of coal?—I mean, whether a cubic foot of wood, and another of fat, would not produce more *flame* than two cubic feet of coal?

"I am, Sir,
"Your obedient,
"F. M."

It is true that in the above suggestion I do not recommend *water* to be mixed with the injected coal tar or oil, and from many experiments which I have since made, I am inclined to think, that with oil, at least, the water willl not be found necessary. I found the oil to produce a clear white flame, without any smoke. Tar, under the same circumstances, certainly does give out a deal of smoke. I have also found that water projected on to a clear coke fire, in a close furnace, is instantly decomposed, and converted into so clear flame, that a bystander, unacquainted with the fact, would imagine that alcohol had been used. Of course the quantity of water must be proportioned to the size of the fire. From half a pint to a pint on two bushels of clear coke, burns well. Thus far I have seen; but Mr. Rutter, it appears, has hit upon the right and most efficient application of these combustible fluids, by properly combining them; he certainly, then, has the merit, and far be from me the wish to detract from it. I rejoice that Mr. Rutter has perfected, and again called public attention to a means which I am convinced will greatly increase and extend the benefits of steam navigation, by facilitating the stowage and acquisition of fuel to an almost unlimited extent.

I have the honour to be,
With the highest esteem,
Your obedient servant,
FRANCIS MACERONE.

London, Sept. 14th, 1833.

PETERBOROUGH-COURT CONVERSAZIONE.

Sept. 25, 1833.

Present—the Editor, Sir Dionysius Dawplucker, Professor Crackwell, Solomon Secundus, Iver M'Iver, &c.

Professor Crackwell.

Mr Editor, is there never to be an end of this undulating railway controversy? I am quite sick of it.

Editor.

Have you *read* the controversy, Crackwell?

Crackwell.

Some portions of it only; not, however, that I expected to learn any thing from it, for from the first my mind was made up on the subject.

Editor.

Then take my advice, Professor, and read every word of it forthwith. You have much more to learn from it, I suspect, than you have any notion of. You say your mind was made up on the subject—as how?

Crackwell.

Why, that the idea of gaining power by the undulating scheme was all nonsense; which, if I mistake not, Mr. Editor, was at one time your own opinion.

Editor.

I confess I did think at first it was founded on a fallacy; but after attentively considering all that has been advanced on both sides of the question, I have come to a very different conclusion.

Crackwell.

What! You are really then of opinion that the force of gravity may be brought in aid of longitudinal locomotion to advantage?

Editor.

Yes; I think Mr. Badnall has made out the theory of the advantage most satisfactorily; and I see nothing in the way of its practical application, beyond certain mechanical difficulties which may very possibly be got over.

Sir Di.

If so, then the pages of the Magazine which have been devoted to the subject have not been wasted.

Editor.

Far from it; the controversy, though it has extended to rather an inconvenient length, and is not even yet come to a close, has been one of the most edifying which has engaged the attention of the scientific world for a long time past. I may safely say, that the principles of locomotion—the now all-important branch of mechanics—were never so clearly elucidated before.

Sir Di.

And yet men of science seem strangely reluctant to do honour to the new light?

Editor.

Yes; Mr. Badnall has had many opponents, but hitherto few supporters; all, however, in good time. Doctrine so sound as his, and so ably expounded and enforced, must, ere long, carry all before it.

Sir Di.

The ability, at least, none can dispute. I have been quite charmed by the manner in

which Mr. Badnall has managed his part of the discussion. He presents to my mind the perfect *beau-ideal* of a good controversialist. So self-assured of the goodness of his cause, and yet so patient of contradiction; so imaginative and enthusiastic, and yet so cool, pains-taking, and methodical; so open to correction, and yet so hard to refute; so courteous to opponents, and yet so true to himself; so bland of speech, even when most stirred in spirit; so felicitous a combination, in short, in one person, of the man of genius, the man of business, and the man of the world.

Editor.

As happily expressed as well merited; and an encomium the more to be valued that men of that stamp are so rare in the scientific circle. Poets have, somehow or other, acquired the character of being the most irritable tribe on the face of the earth; but judging from my own experience—which you will all allow to have been considerable—I should say that in this respect the gentlemen of the exact sciences beat them hollow. I have seen more bitter wrath excited by a mathematical question of plus or minus, where all the difference did not amount to the ten thousandth part of a hairsbreadth, than all the quarrels of the Popes and the Dennis's ever produced.

Iver Mac Iver.

Nae personal reflections, Mr. Editor.

Editor.

Neither personal nor national reflections, Iver, have ever any countenance here. I meant nothing of the kind I assure you; but on the contrary, that

——" my taxing, as a wildgoose,
Should go unclaimed of any man."

And had I really been otherwise disposed, Iver Mac Iver, the favourite pupil and faithful friend of the illustrious Playfair would have been the last man in the world at whom any shaft from my quiver would have been directed. Speaking of national reflections, by the bye, do you know, Sir Di., that the remarks you made at our last meeting, respecting American education, have given great offence in several respectable quarters.

Sir Di.

I dare say; but has any one offered to disprove them?

Editor.

Yes, Mr. Rich, the American bookseller, writes me, "that he never met with a more contemptible instance of ignorance, or wilful attempt at misrepresentation," in all his life; and he has sent me a little book, lately compiled by himself,* which, he thinks, "may supply some information to the members of the 'Peterborough-court Conversazione,' on subjects on which at present they *appear to be be wofully* deficient."

Sir Di.

Whew! Brave speaking this; but let us see the "little book" that is to accomplish such wonders.

Editor hands the book to Sir Di, who examines it attentively.

Editor.

I ought, perhaps, to mention for your government, what the particular matter-of-fact is, which, in Mr. Rich's opinion, this book will be found to establish beyond all dispute. "Mr. Kempson," he says, "refers to the *New England States*, which are *the manufacturing states*, and what he states of them is well known to be true. But what has Pennsylvania, or New York, or New Jersey, or Kentucky, to do with New England?"

Sir Di.

With all respect for Mr. Rich—a gentleman whom I remember well, as American Consul at Madrid, and of whom I can never think but with respect, for his uniform urbanity, and his extensive knowledge of men as well as of books—with all respect, I say, for Mr. Rich, I must deny altogether the correctness of his representation of the case. Mr. Kempson did *not* speak of the New England States exclusively; neither are the New England States exclusively "*the* manufacturing States." Mr. Kempson was first asked, "To what do you attribute this state of things (the absence of combinations) amongst the AMERICAN workmen?"—the American workmen *generally*, be it observed, and not the workmen of New England, or any other section of the Union. He made for answer, "To their *superior education*, to their moral instruction, and to their temperate habits." He was next asked, "Have you any *national* system of education?"—that is, have the United States, in the aggregate—not the New England States in particular—any national system of education? And he replied, "*We* have public schools, supported partly by State funds, and partly by bequests. *All* children have *the privilege of attending*." Still you will perceive no limitation whatever; it is of *all* the States, and of all *the* children in them that he speaks. Then came the searching question, "Do they, *in point of fact*, very generally attend in the manufacturing States?" And he made this sweeping answer, "THEY UNIVERSALLY ATTEND; and I think that information is more generally diffused through the villages and the whole community of the New England States, than amongst any other community of which I have any knowledge." Mr. Rich would argue, I suppose, from the men-

* A General View of the United States of America: with an Appendix, containing the Constitution, the Tariff of Duties, the Laws of Patents and Copyrights, &c. &c. &c.

tion of the New England States in the latter branch of this answer, that Mr. Kempson must be understood as having spoken of the New England States throughout; but I do not see how such a construction of the evidence can possibly be admitted. The best key to the meaning of every witness, is to be found in the nature of the questions addressed to him. Mr. Kempson was not asked what the state of education was in the New England States; but what it was in the United States at large. And when he replied, that there were public schools which "all the children have the privilege of attending," he must, of course, have meant his reply to be as general as the question addressed to him. Had his examination stopped here, as it might, there never could have been a question about it. The only point which his reply left in doubt was, whether all the children actually exercise their privilege of attending school; and to clear up this the Commissioners put the further question to him, "Do they, in point fact, very generally attend in the manufacturing States?" specifying the manufacturing States in particular, because it was their special business to ascertain how far the character of persons engaged in manufactures is influenced by education. He replies, "THEY UNIVERSALLY ATTEND." He adds, to be sure, "and I think information is more generally diffused through the villages and the whole community of the New England States than amongst any other community of which I have any knowledge;" but there is nothing in this addition to entitle us to infer that he meant by it to limit the scope of his preceding answer. It is rather an extension of that answer—a following of it out to one of its natural consequences — general information exhibited as the result of universal education. It is as if he had said, "I know that the children of the manufacturing States universally attend school, and I can answer, for the New England States, at least, that this universal schooling has had the effect of producing a better informed community than I have ever met with any where else."

Mr. Testall.

That is precisely as I understand Mr. Kempson's evidence. But what do you say to Mr. Rich's argument, that the New England States are exclusively the manufacturing States?

Sir Di.

I was just coming to that. I see nothing in Mr. Kempson's evidence which should lead us to suppose that he used the two phrases indiscriminately; and 'tis very unlikely he should, since, in point of fact, New England comprehends but a portion, and that the least considerable portion, of the manufacturing States of the American Union. The New England States are Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, and Connecticut, including neither New York, nor Pennsylvania, which contain between them nearly twice as many inhabitants as the whole of the New England States put together, and exceed them in a far larger proportion in point of manufacturing and commercial importance. How many States may be entitled to the name of "manufacturing," I cannot positively say; but this I know, that at the celebrated convention. which met a year or two ago at New York to uphold the tariff system, which has for its grand object the promotion of the domestic manufactures of the Union, at the expense of every other national interest, there were delegates present from no less than *twelve* States of the Union—that is, from twice as many States as are included in New England.*

Dick Dubious.

Does not the book of Mr. Rich's, which you have in your hand, show how the different manufactures of the Republic are located?

Sir Di.

No, in this respect it is singularly defective. You have a general chapter on the "commerce, manufactures, agriculture, and mechanic arts" of the United States; but nowhere any account of the products of each particular state.

Editor.

'Tis a great omission, certainly, and one which it would be judicious in the author to supply in the future impressions of his work.

Sol. Secundus.

And when he does supply it, I hope he will at the same time explain why he gives the character of "manufacturing" to certain States exclusively, which are not half so much manufacturing as others to which he denies the name!

Testall.

Explain! That I imagine would not be easy. The facts just mentioned by Sir Di seem to me unanswerable.

Dubious.

Well, that may be, and yet Mr. Rich be right in the main. Let us suppose, with that gentleman, that it was the New England States alone to which Kempson alluded, when he asserted that the children "universally attend" school, and let us leave out of view altogether the question as to which are the manufacturing States, and which not—how will the case then stand? Is Mr. Rich correct in affirming that "what he

* See further Evidence on American Manufactures in last Number, p. 437.

(Kempson) states of them (the New England States) is well known to be true?"

Sir Di.

I should say, decidedly not. I am not in possession of as full and authentic details of the state of education in the New England States, as those I quoted at our last meeting respecting Pennsylvania, New Jersey, and Kentucky. I expected to find these details supplied by this book of Mr. Rich's; but here, again, it is sadly deficient. It tells every where of the means provided by the States for the education of the people, but leaves the reader very generally in the dark as to the extent to which the people have availed themselves of these means. Even as the book is, however, out of Mr. Rich's own mouth will I convict him—of being greatly in the wrong. Massachusetts is a New England State, and Boston, the capital of that State, is the largest city in New England. Now I find, from Mr. Rich's book, that, according to the Report of the School Committee of Boston, in November, 1829, the number of public and private schools was 235, and of pupils 11,448; which last number, compared with the population (61,392,) is only as (about) 1 to 5. But, on referring to the general census of 1830, I find that the number of children between 5 and 15 is 284,503, out of a (white) population of 10,530,044, that is (about) 1 to 4; and if we apply the rule of proportion thus obtained to the case of Boston, then it must follow that, in this chief city of that portion of the United States, where, according to Mr. Kempson, the children "universally attend" school, and the community at large is the best informed in the world, there must be at least one-fifth of the children who never go to school at all!

Testall.

The proportion must, of course, be much greater in the country parts of Massachusetts, and the other New England States?

Sir Di.

Without a doubt—in all probability one-fourth; and yet we have Mr. Kempson, and Mr. Rich after him, gravely affirming, that in the New England States there are schools for *all*, and that *all* attend them

Dubious.

And what is still stranger, that you have but to cross into any of the adjoining States —over some arbitrary line of topographical division—and you shall find the case perfectly reversed—schools for all, and not more than one-third of the youth attending! The thing is incredible.

Sol. Sec.

Slight not so, Mr. Dubious, the influence of local boundaries. Have you never heard of the wonderful difference to be witnessed on crossing a small stream called the Tweed? What saith our worthy Editor?

Editor.

Why, if the truth must be spoken, that the difference in point of education between England and Scotland has never been so great as has been pretended. The Reports of the Factory Commissioners are full of proofs that ignorance exists in many parts of Scotland, and among the manufacturing classes of the Scottish people in particular, to as lamentable an extent as in either England or America.

Iver Mac Iver.

Out upon thee, for a false and traitorous loon. Shame! shame! Sir, to speak sae of your ain glorious country.

Editor.

The shame, friend Iver, is not to those who prefer truth to country, but to those who are so puffed up with national conceit as to care nothing for truth, so that the reputation of their country is exalted.

Mac Iver.

The reputation of Scotland, Sir, stands nae in need o' ony aid frae fiction. In arts, as in arms, her sons are acknowledged by a' the warld to hae shown themselves perfectly unrivalled. As was weel said by the great Irish orator, Curran, "Whatever ither countries may boast o'—England o' her fleeces, Ireland o' her potatoes, France o' her vines, or Spain o' her olives—there is yae crap in which Scotland beats them a', and that's a crap o' men."

Editor.

Yes, Iver, something to that effect he did say in one of his oratorical flights, which the Scotch have been vain enough to take for but a sober statement of the plain truth. But supposing what he said were as undoubted as I am afraid it is questionable, how does your "crop of men" establish the fact of the universality of education in Scotland, which is the point in dispute? I need not tell you, Iver, that there is a force of character which frequently exists quite independently of education. The very circumstance of Scotland's having no other crop to boast of than a crop of men, might suggest to you some pregnant doubts on this head. A barren soil and a keen air are wonderful incentives to energy of character.

Mac Iver.

Nae doubt; but you forget our parish schools, Sir. There's naethin', I believe, better established than that it is to them, aboon every thing, Scotland is indebted for the great superiority of her people over other nations.

Editor.

No, I do not forget them. I am well aware that in every part of Scotland, with the exception of the royal boroughs, and other large

towns, there are the means provided by law for the education of the young; and though not disposed to assign to this circumstance so high a station among the causes which have raised the character of the Scottish people as you do, I am far from disputing that it must have exercised a most extensive and salutary influence. I wish merely to impress this *little matter of fact* upon your attention, that in spite of the admirable provision which has been made in Scotland for the education of the people, the number of uneducated persons there is at this moment sufficiently great to be a disgrace and a reproach to the country.

Mac Iver.

By my troth, this is something new! Scotland, the maist educated country on the face of the earth, reproached with neglect of education!

Editor.

But facts, you know, Iver, are, according to your own favourite bard, "stubborn things, and mauna be disputed." Attend for a moment to what the Central Board of Factory Commissioners say, in their first report:—"Few will be prepared to expect the statements that will be found on this head in regard to Scotland, where the education of the children is neglected to *a far greater extent than is commonly believed*; where only a very small number can write; where, though perhaps the majority can read, many cannot; and where, with some honourable exceptions, it seems certain that *the care once bestowed on the instruction of the young has ceased to be exemplary.*" What say you to that?

Mac Iver.

The Commissioners were Englishmen, probably?

Editor.

No—as genuine Celts as yourself, Iver. A Stuart and a Macintosh.

Mac Iver.

Alas! then, for the glory of auld Scotland! How wofully changed she must be since I left her blue hills behind me.

Sir Di.

Changed or not changed, since it seems indisputable that things are so at the present moment, this should cause us to be the less surprised at the similar opposition which exists in America between the law and the fact in regard to education.

Dubious.

I don't know: Scotland is an old country, America a young one; and it is commoner to see age than youth relax in a career of active usefulness.

Sir Di.

True; but we have no proof that the case of the United States is one of relaxation. I see no reason to believe that education was *ever more general* there than it is at present.

Sol. Sec.

In Scotland the certainly otherwise. The time has been when she excelled England immeasurably in respect of education; and this makes good the purpose I had in view in removing the discussion for a moment to the banks of the Tweed, which was to exemplify how narrow a boundary may sometimes divide a state of general enlightenment from one of great darkness. Since there once prevailed so great a difference between Scotland and England, why may not the like prevail between New England and Pennsylvania? Unriddle me this, Mr. Dubious.

Dubious.

I am not sure there ever was that difference between Scotland and England, *in point* of education, which you take so readily for granted.

Sol. Sec.

Oh, to be sure, the proofs are wanting! Just as there is that there ever was any difference between Attica and Bœotia!

Dubious.

You seem intent, Solomon, upon fastening on me a doctrine for which I have never contended. I have not disputed that one portion of a country may be enlightened and another not. My argument went no farther than to the case in hand; and with respect to that, I must still maintain that 'tis wholly incredible there should exist so great a difference in point of education as is alleged between the Pennsylvanians and New Englanders, considering how little difference there is between them in all other respects; descended as they are from one common source, speaking one common language, professing one common faith, and enjoying equally the advantage of liberal political institutions.

Sir Di.

But better than all reasoning about the matter, is the positive fact that no such difference does exist; that in the New England, as well as in all the other States of the American Union, education is far more extensively neglected than is commonly imagined, or than Mr. Rich is willing to allow.

Testall.

Mr. Rich has not, I believe, contested the accuracy of what Sir Di stated at our last meeting, with respect to Pennsylvania, New Jersey, and Kentucky.

Editor.

No; but he asks, "what has Pennsylvania, or New Jersey, or Kentucky to do with New England?"

Sir Di.

Which is a plain admission that what I have stated of Pennsylvania, New Jersey, and Kentucky, is true. And this suggests to me to put in return a question to Mr. Rich, which I suspect he won't find it so easy to answer. It is this,—How comes it, that in the chapter of this book of his which treats of "education" in Pennsylvania, there is not the slightest mention of that "mass of gloomy

facts" on the subject, the truth of which he is now constrained to admit? He there tells us that "*the constitution* (of Pennsylvania) declares that the legislature shall, as soon as conveniently may be, provide by law for the establishment of schools, in such manner that the poor may be taught gratis;" that "under this injunction *means* have been provided in nearly all the counties of the State for the instruction of the children of indigent parents;" and that "they are sent to the most convenient schools of the neighbourhoods in which they respectively reside, and the expense is paid by the county commissioners." But he does *not* tell us what the report of the Pennsylvania Society for the Promotion of Public Schools has made known, that in spite of the beneficent declaration of *the constitution*, and in spite of *the means* of educating the poorest of the community having been provided by the legislature, "the average proportion of children (rich and poor) educated in one year, compared with the entire number of children between 5 and 15, is BUT ONE OUT OF THREE." Is this, I ask, candid? Is it fair?

Editor.

Mr. Rich may not have been aware of the Report to which you allude.

Sir Di.

That is not at all likely. So well-informed a gentleman—with respect to American matters in particular—could not well be ignorant of a fact which must be tolerably notorious to the whole of the American Union. Besides, he quotes repeatedly different American works, in which the fact is mentioned and commented upon.

Testall.

I shall believe that Mr. Rich was ignorant of the fact, when he himself affirms as much on the honour of a gentleman. But, in the meanwhile, I can but ascribe the suppression of it to the same inordinate love of country, of which our worthy Editor has before spoken, as leading people to care but little for truth, so that the reputation of their natal soil is exalted.

Sol Sec.

Smacks altogether, pretty tarnation considerably, methinks, of "almighty mystification."

Tout-Voix.

And as to the witness, Kempson—how stands the case now as regards him?

Sir Di.

Why that, view his evidence as you please—whether as referring to the New England States alone, or as referring to the "manufacturing States" generally, including under that term what you will, or as referring to any State whatever within the belt of the American Union—it is as, I said at first, as "impudent a falsification of notorious facts as ever was attempted in the face of the civilised world." Strong words, gentlemen! but not, I submit, more strong than the occasion calls for.

Tout-Voix.

Where, then, be the proofs of that "contemptible ignorance" of the matter in hand, that "woful deficiency of information," with which Mr. Rich has been so civil as to accuse us of Peterborough-court? Of whom may it be most truly said, in the words of his good-tempered note to the Editor, that a "more wilul attempt at misrepresentation" was never witnessed.

Editor.

Mr. Rich will, I am sure, regret that in the warmth of his nationality he ever made use of such unmerited language. I trust he will be convinced, too, when he peruses the report of this our further colloquy on the subject—when he sees how careful we have been to get at the real facts of the case, and how ready some of us have shown ourselves to sacrifice our own most dearly cherished national prejudices on the altar of truth—that we must have been influenced in the part we have taken by far higher and more honourable motives than any he has been pleased to ascribe to us.

Sir Di.

I protest that if I had not thought it concerned as much the welfare of our American brethren as the credit of our own country, to expose the gross misrepresentations of the witness Kempson, in his evidence before the Factory Commissioners, I should never have broached the subject. If it be true, as Pope says, that the highway to wisdom is "to see each other's faults, and feel our own," there can be none to whom this sort of conviction can be of more value than a young people just rising into importance.

Editor.

Ah! if the Americans would but view the matter in that just light, they would discern more real friendship in one word of frank admonition than in whole volumes of fulsome encomium.

Dubious.

And reason too, abundant in *facts as they are*, without the smallest exaggeration or embellishment, to be satisfied with the progress they have made. The Americans are just as any person reasoning from general principles would expect to find them,—not any where so universally educated as Mr. Kempson and Mr. Rich would fain wish them to be thought, because every where the labours of the field and of the workshop are still so much in excess, compared with the population, as to leave but little leisure for intellectual culture, but better educated than any other people of the same standing that can be mentioned, be-

cause they have had the advantage of freer and wiser institutions than (perhaps) any other people that ever existed. It is from a reaction, I apprehend, of the same general law, that education has fallen into such comparative neglect in Scotland.—"Want of bread" has there taken the place of the cry of "want of hands:" there are more mouths to feed than means to feed them with; whence has arisen an excessive competition for employment, and an extension of the hours of labour far beyond the ancient standard; the consequence of all which is no leisure for schooling or reading, and a general relapse into ignorance, and (if not checked in time) into barbarism.

Sir Di.

You say well, Mr. Dubious; and there are, on the Minutes of Evidence taken by the Factory Commissioners, but too many illustrations of the correctness of your view of the state of things in Scotland. For example, Cecilia Gregg, a spinner in a mill at Kirkaldy, states as follows: "The *long hours* have prevented her from getting education. She would far rather have her wages less and hours shorter, than the present hours, for she thinks they are 'no much better than the Egyptians in Egypt, and their life is no pleasure to them.' No school belongs to this mill; she cannot sew well, and can read little, and cannot write.

Iver Mac Iver.

This is quite awfu', and fully accounts for the wonderfu' change that has taken place in Scotland, in respeck o' the education o' her people. The introduction o' that vile cotton manufacture is at the root o' a' the mischief.

Sol. Sec.

Not forgetting, Mr. Mac Iver, that love of pelf (so abhorred by all true Scotchmen!) which (to go still deeper) is at the root of the introduction of the cotton manufacture into Scotland, and of the prodigious zeal with which it has been pursued in that *fag* end of our "tight little island."

Iver Mac Iver.

Fag end! Umph! I'll tell you what, Mr. Solomon Secundus——

Editor.

Gently—Iver, our friend Solomon must have his joke as usual, but I am sure he means no offence.

Sol. Sec.

Oh, none whatever. I mean only to hint that it is this abominable fagging system which has thrown Scotland so much back in the march of civilisation.

Sir Di.

I don't think it can be said of Scotland generally, that it has fallen back; it is the *education of the* manufacturing classes only *that is so neglected.*

Crackwell.

And may not that be partly ascribed to the circumstance of the parochial school system, for which Scotland has been so famous, not extending to the large towns, where the factories are chiefly situated?

Sir Di.

No doubt that must have had its influence; but all other causes appear to be as nothing compared with the excessive toil to which the factory children are subjected. There is a passage on this subject in the report of Mr. Macintosh, one of the Commissioners who visited Scotland, which is particularly deserving of attention:—"After a child," he says, "has been employed for twelve and sometimes more hours confined in the atmosphere of a factory, to insist upon any farther confinement appears as *cruel*, as the better opinion of the schoolmasters, who have deposed as to the physical condition in which they find the scholars in the evening, seems to declare it *almost useless.* I have met with instances of girls attending a considerable time at school, till nine often, and sometimes ten o'clock at night, who were obliged to begin their work next morning at half-past five and six o'clock. It is high time I think that a state of things which thus places the rudiments of *instruction* within the reach of those children only at the price of a ruined constitution, should be mitigated, without taking into consideration that it occurs in a country that boasts of so general an education of its lower orders."

Editor.

High time, indeed! High time, too, that something more than the mere rudiments of education—by which term is meant, I presume, reading and writing—should be imparted to the whole of our working classes. I would recommend to Mr. Marshall of Leeds, and those who think with him, that "all the education suitable" for persons in their "station in life," may be acquired "before they are nine years old," to peruse with attention the collection of "Extracts from the Reports made to the Poor Law Commissioners," on the subject of "Education," which Mr. Chadwick, one of these Commissioners, and also one of the Central Board of Factory Commissioners, has judiciously had printed for separate distribution. They will read there some lessons of wisdom and benevolence which may haply raise a blush on their cheeks for the contracted notions they have promulgated on the subject. One of the witnesses, a Mr. William Hickson, being asked, "Are you of opinion that an efficient system of national education would materially improve the condition of the labouring classes?" makes this admirable answer, "Undoubtedly; but I must beg leave to observe, that something more than the mere teaching to read and

is necessary for the poorer classes. Where ·. and newspapers are inaccessible, *the edge of the art of reading avails nothing.* e met with adults who, after having taught to read and write when young. almost entirely forgotten those arts for of opportunities to exercise them.—*ledge must be made cheap, or it will never t the poor.*" He is farther asked, "Then believe the low-priced periodicals now shed will have a beneficial tendency?" e makes this shrewd reply, "I believe enny magazines will work usefully; but newspapers would do much more good. e found it difficult to create an interest : mind of an ignorant man on matters re general literature; but his attention ily enlisted by a narrative of the stirring s of the day, or local intelligence; and I e that an account of the trial of a poacher, or even a murder, in the immediate neigh- ood, will often do more towards the ac- ıg habits of reading, and paving the way neral information, than any other means could be adopted. The dearness of ıapers in this country is an *insurmount- bstacle to the education of the poor.* I name twenty villages, within a circuit ew miles (in Kent), in which a news- is not seen from one year's end to er."

Sir Di.

. Hickson takes the right view of the r. To teach the poor the art of read- nd then to deny them the means of ex- ng it, is in truth to do nothing. I won- ıowever, a man of Mr Hickson's good should speak so favourably of the influ- f the low-priced periodicals, for to my most of them are a perfect disgrace to terature. They have positively grown a public nuisance. Such of late has the influx of this penny and twopenny —

Editor.

tly, Sir Di. You should remember that e ourselves but threepenny.

Sir Di.

s not, of course, to the price that I ob- ut to the absolute worthlessness of their ıts, at any price. With a very few ex- ns (among which I can hardly say that ude the Chancellor's *Penny Magazine*) ıre mere patch-work, put together by f scissors and paste, without the small- ste or judgment.

Editor.

ınnot altogether agree with you on this Sir Di., well-merited in the main tho' strictures be; for to me it seems better at the people should read even the worst trash to which you allude than nothing I fall quite in with Mr. Hickson's ı, that so that you produce a taste for reading, no matter by what means, good must come of it in the end. What is most to be deplored, I think, is, that the iniquitous taxes on knowledge should have been the means of shutting out a more wholesome diet; that the government should so insanely persist in say- ing, "Nay, you must not," to those who are both able and willing to impart to their poorer countrymen knowledge of a better de- scription.

Crackwell.

I do not see what there is to prevent the able and willing gentlemen you speak of from exerting their talents for the improve- ment of the low-priced periodicals of which you were speaking.

Editor.

This only—that were they to treat in them of those matters which most require to be treated of, the Attorney-General would ex- chequer them for their pains. You may pro- mulgate through such channels what notions you please on the subject of religion. You may speculate as you will on all sciences except one—the science of good government; but dare to speak of *that*, only offer to en- lighten your countrymen with respect to their rights, privileges, and duties, as men and citizens, save with a government *imprimatur* in the shape of a stamp, which more than doubles the cost of the article to the pur- chaser, and fine and imprisonment are your portion. There are those, no doubt, who will sneer at Mr. Hickson's notion of "the dear- ness of newspapers in this country" being an "insurmountable obstacle to the education of the poor;" but that is because they ima- gine the poor have no business with that political knowledge which newspapers have the exclusive privilege of disseminating. Now, according to Plato's definition of educa- tion—the justest definition of it, perhaps, that was ever given—it is that which "qua- lifies men to be good citizens, and renders them fit to govern or to obey;" that is to say, nothing; in the opinion of that great philo- sopher, is entitled to the name of education, whieh has not for its main feature that po- litical instruction, to the attainment of which by the poor *our* rulers have in their great wisdom attached an "insurmountable ob- stacle."

Sir Di.

'Tis a monstrous scheme of government, to be sure, to lock up that very knowledge which can alone make men easy to govern.

Editor.

Oh, it is lamentable! Laws without num- ber almost are made, and severe penalties are attached to the breaking of them; yet is it deemed altogether superfluous to expound, nay even to announce them, to those who are exposed to their vengeance. And, worse than al , should any one attempt to perform for

the powers that be, that duty which they have so shamefully neglected, he is punished with as much rigour as if he had been guilty of some high crime or misdemeanor! But let not the British aristocracy—the gentlemen of the "nine year old" finish—deceive themselves; "intellect" *is* indeed on its "march;" the power exists not that can say to it, "thus far shalt thou go, and no farther." The stamp laws, which form at present the "insurmountable obstacle" in our path, must, ere long, vanish before the force of public opinion. The penny and two-penny publications of which we have been speaking are but the pioneers of others, which will then appear, of an infinitely more useful character—but signs of the times, which he who runs may read, and read with satisfaction and delight. How great must be that thirst of knowledge which pervades the productive masses of this vast empire, when works like these, of indifferent merit as they in general are, command so extensive a sale! "If these things be done in the green tree, what shall be done in the dry?"

Tout-Voix.

I must confess, for my own part, that I entertain great doubts as to the utility of so extensive an education as you speak of to working people. What you say is all very well in a general way; but apply it to a particular instance or two, and see what you will make of it. Take a common ploughman, for example—what could a man like that learn from books or newspapers that would be of any benefit to him in his calling?

Editor.

Much, Counsellor—much, that would be of the utmost benefit to him both as a man and as a tiller of the ground. To satisfy you of this, I need but read to you what another most sensible witness, examined by the Poor Laws Commissioners, the Rev. H. C. Curtis, rector of Padworth, in Berks, says, in answer to a question of a similar sort which he supposes to be put to him:—

"Shall a man make a better hedge because he is able to read? My answer is, most certainly; for if the mind make the man, a labourer whose intelligence is improved, by what means it may, will always be found to do his work with more expedition, neatness, and durability; and this I uphold will be the case of the labouring man, abstractedly considered, without reference to any particular information to be acquired from books treating on agricultural subjects. * * * They who are unacquainted with agricultural pursuits are apt to imagine, that to hold the plough it is necessary only to look out for the greatest dunce in the country; but an intelligent ploughman is of the first consequence on a farm. In short, there is as much (if not more) intelligence required in the different employments of the agricultural classes, as in those of mechanics or tradesmen. *Intelligence is requisite in all, and the more she is increased and perfected throughout the kingdom the greater will be the quantity of agricultural produce.*"

The witness gives afterwards a very remarkable exemplification of the truth of these observations in the case of a young labourer in his parish, of the name of George White, who had been taught to read and write, and whose "acquirements have much improved his intelligence." "I wished to introduce the use of a new-fashioned plough into this parish; he was the only one among the labourers whom I asked to handle it that took any real interest in the plough, and endeavoured to ascertain its real advantages. The other labourers could not read or write." I must add yet another extract from this reverend gentleman's evidence, even at the risk of trespassing on your patience. I am sure you will be all much gratified with the liberal and manly sentiments it contains on the subject of setting a limit to the education of the poor: it furnishes a most triumphant answer to the advocates of the "nine year old" finish:—

"I have heard some exclaim, Ah! thanks to this march of intellect, we shall soon be without ploughmen, &c. My answer to this foolish unmeaning cavil is this:—It is not taught in the Scriptures, nor is it to be inferred by any reasoning from analogy, that there is a certain line of improvement beyond which the human race cannot advance. On the contrary, it might be shown by sound argument, and the most clear illustrations from the past history of man, that the human intellect is capable of making continual advances, and thereby inducing proportionate improvements in civilisation and social happiness. * * * Strange as it may seem, I have heard some object to teaching the lower classes to write, though they will allow them the privilege of learning to read. I shall merely state, that the same argument in favour of giving them this acquirement may be urged with the same force as in the case of that of reading, which is, that it will increase their intelligence, refine their manners, and improve their habits, as might be clearly shown by a regular train of consequences. And here let us ask—Have not the labouring classes the same wants and feelings as the higher? Why should they be debarred the facility of making notes, &c., and in general by the art of writing, of assisting themselves in the business of life? Why should they not be enabled to communicate to one another at a distance their circumstances, desires, and affections? *In fine, let us remember that the lower classes are no longer slaves, but freemen, and that the more refined their manners and habits are, and the more improved their intelligence is the more useful members of society they will become.*"

Sir Di.

All that is quite admirable. *O si sic omnes!* Then, indeed, might the Church of England proudly bid defiance to all her enemies! I move, Mr. Editor, that the portrait of the Rector of Padworth be hung up in the hall of our Conversazione, as another of "the elect in the work of regeneration." *(Motion carried by acclamation.)*

Tout Voix.

I join most cordially in this tribute of respect to the excellent Rector. I confess that his arguments have thrown me fairly out of court. There is, however, yet one other point which I think wants clearing up, which is this:—Ought the education of the people to

be made an affair of government? I think, Mr. Editor, you gave it as your opinion, on a former evening, that the less governments have to do with forming the minds of the people the better?

Editor.

Yes; but not meaning by that to object to the establishment by law of a permanent system of national education, to be worked out by the people themselves. It was merely to the arbitrary interference of the ministers for the time being with the course of popular instruction which I objected; as, for instance, by determining what-text books should be employed in the schools, or what branches of knowledge should be more particularly cultivated; and to this I was prompted by the complaint of our friend Junius, that there is no minister of public instruction in this as in other countries. I am still of opinion that such a functionary would, among a free people like ourselves, do far more harm than good. However, as Junius is not here to-night, I think it would be scarcely civil to him to go into the question in his absence. Suppose, therefore, we adjourn the consideration of it for the present?

Tout Voix.

By all means: only let it be understood that it shall have the precedence of all others at our next meeting, and let Junius be specially summoned to attend.

Crackwell.

I second the proposal of adjournment with all my heart. I should for my own part never tire of listening to such edifying discourse as we have had to-night; but it is not every one who cares, as you and I do, Mr. Editor, for the good of our fellow creatures. There's Solomon fast asleep, and Testall not much better.

Crucible.

Your love for your fellow creatures, Professor, I may not dispute; but beshrew me if I don't think you would at this moment prefer a defunct muirfowl, finely grilled and seasoned, to the best homily on the improvement of the human race that ever was written. Confess, now, the truth. You long to be at the Major's grouse?

Crackwell (laughing).

Man is but weak; and the Major's grouse, I am told, is incomparable.

Iver Mac Iver.

Ye're forgetting, Mr. Editor, I hae a craw to pluck wi' you about that trigonometrical question, before we break up.

Editor.

We can do that after supper, Iver, when the gallon of Glenlivet which is dependent on that question can come in very appropriately after we have done justice to Barbette's present from the moors. I have a very comical letter, *by the bye, from* the Major, which I *will read to you while the* punch is brewing.

THE LATE WILLIAM SYMINGTON, AND THE INVENTION OF STEAM-BOATS AND STEAM-CARRIAGES.

Sir,—I have noticed, with pleasure, the assistance you have given, from time to time in your valuable Publication, to the friends of Mr. Symington, in their laudable endeavours to show that he was not only the inventor of steam locomotion, but the first person who applied steam to move a carriage as well as to propel a boat. Whatever other persons may have talked about it, or pretended to do, I know not, but I knew Mr. Symington for more than thirty years successively, and I am sure if a James Taylor, or any other person, had had any pretension to the invention I must have heard of it. I also knew Messrs. Stanton, Carlow, Weir, and others mentioned in this business, and I never heard them speak of Taylor as the inventor. Mr. Symington was a very clever and intelligent man, and fully capable of doing what has been said of him. His father was a practical mechanic, and superintendant of the Mining Company at Lead Hills, where Mr. Watt erected a pumping engine. Here was an excellent opportunity, for an ingenious youth from college, to improve his ideas; and, certain it is, young Symington was not slow in availing himself of it. It is well established, that almost before he was a man he produced one of the greatest improvements on the steam-engine which had at that time been proposed, and which placed him the *very* next to Watt. Had he only met with a Boulton, &c., he might, probably, have numbered engines with his great rival. It appears that his genius was not only displayed in inventing an useful engine, but that that engine was so totally different from Mr. Watts, that no infringement could be proved, "wide as the circle was that Mr. Watt had drawn around his invention. The sketch, however, which you have given of Mr. Symington's engine, in your Journal of the 24th of July last, is rather imperfect, as there is one valve wanting, and other things reversed. It, nevertheless, exhibits sufficiently that beautiful idea of a medium piston, with which Mr. Symington could produce a finer vacuum in the cylinder than Mr. Watt could do by his separate condenser and air pump, and also without cooling the cylinder at every stroke, by the in-

jection water, as the common engines at that time did do; and I can assure you, that Mr. Symington's engine could do any given quantity of labour with as little fuel as Mr. Watt's, and that Mr. Symington's could lift more on each square in the area of the piston, than Mr. Watt's engine. I have also to inform you, that Mr. Symington's engine was not confined to pumping only; but that it was successfully applied to drive machinery in different parts of the United Kingdom. Some were also sent to the Indies, and several were erected about London. After Mr. Symington's first patent, as well as that of Mr. Watt, had expired (for they both ended about the same time), Mr. Symington was amongst the first (1801) to alter the shape of steam-engines, so that they should occupy less room, and be applicable to vessels in general. This may justly be called the real commencement of steam navigation. Here I must observe, that Mr. Symington was then called almost a madman, because he employed about a ten horse power engine to propel a boat, viz. the "Charlotte Dundas;" although now it is common to have more than ten times that power on board. I can also assure you, that Mr. Fulton got his first knowledge about steam-boats from Mr. Symington, and this I had occasion to assert publicly sometimes. Mr. Bell, and all the others about Glasgow, had also their first steam-boat knowledge from the same source. May I add, that I learnt myself the rudiments of mechanism under Mr. Symington; and, I believe, you know that I have added a few items to the useful arts.

I remain, Sir,

J. DICKSON, Engineer,

60, Holland-street, Southwark,

Sept. 14, 1833.

Another Steam Trip to Brighton.—Sir Charles Dance has, as well as Mr. Hancock, been trying the Brighton road with his steam drag. He went down from London on Friday last, in six hours, 22 minutes, and 15 seconds, and returned next day in five hours, 55 minutes, and 30 seconds. The *Times* refused to publish this fact, except as an "advertisement;" in which shape it appeared on Wednesday last. We call this inconsiderate; for though the *Times* may have good and sufficient reasons of its own for thinking there is a *little matter of private speculation* at the bottom of the stir made about this exploit, still it is of great importance to *the public* that every actual performance of the kind should be *made known.* After all, however, it is not any *dozen of such isolated exploits* that is wanted to make men of capital embark in the speculation of steam travelling on common roads, but an honest and explicit statement of the expense of working a steam-carriage for some two or three months without intermission—or, at least, with no more intermission than is common to carriages drawn by horses. The only person who is, *at present*, in a condition to supply such information, is this advertising Sir Charles Dance (from his experience, a few years ago, on the Gloucester and Cheltenham road); and yet we have never been able to discover that he *has supplied* it, though, as thousands can bear witness, he has been more than once challenged to do so.

LIST OF NEW PATENTS GRANTED BETWEEN THE 22D OF AUGUST AND 22D OF SEPTEMBER, 1833.

William Godfrey Kneller, of Mitcham, Surry, chemist, for certain improvements in evaporation. August 24; six months to enrol.

Richard Else, of Bath, gentleman, for certain improvements in drying malt. Sept. 7; two months.

William Church, of Heywood House, Bordesley Green, near Birmingham, for certain improvements in machinery or apparatus to be employed in the transportation of goods or passengers, parts of which said improvements are also applicable to the ordinary purposes of steam engines. Sept. 7; six months.

Isaac Dodds, of Horsley Iron Works, Staffordshire, engineer, for an improved combination of materials and method of manufacturing valves for steam-engines or steam apparatus, or for any other fluid or gas, or in any other situation wherein valves or sluices may be used. Sept. 14; six months.

John Heathcoat, of Tiverton, lace manufacturer, for certain improvements in machines or machinery used in the manufacture of bobbin net. Sept. 14; six months.

John Scott Howard, of Chowbent, county of Lancaster, machine maker, for certain improvements in machinery called roving frames, for roving cotton and other fibrous substances. Sept. 21; two months.

Louis Cournier, of Kennington Green, Surry, gentleman, for an improvement in curing certain maladies of the head, being a communication from a foreigner residing abroad. Sept. 21; two months.

Fitz Walter Williams, of Gilbert-street, Oxford-street, Middlesex, gentleman, for a liquid or composition for polishing furniture and other articles, which he intends to denominate Williams's French polish reviver. Sept. 21; six months.

John Robertson, of Crofthead, in the parish of Neilston and county of Renfrew, cotton spinner, for certain improvements in the mull jenny or other machine for spinning of cotton, and in the belly stretching frame or other machine for roving of cotton, and in the machinery for spinning and roving of silk, wool, flax, hemp, or other fibrous substances. Sept. 21; six months.

INTERIM NOTICES.

The Supplement to the present volume will be published on the 1st of November.

Communications received from Messrs. Heaton, Brothers.—W. D.—Mr. G. Marsland.

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END OF VOLUME NINETEENTH.

INDEX

TO

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